



# EXPERIMENT STATION RECORD.

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## EXPERIMENT STATION RECORD.

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There is an impression that the progress in experimental work on the feeding of farm animals is not all that might be expected or is desirable, considering the importance of the subject and the prominence it has held in the past. This feeling was voiced in the address of a former president of the American Society of Animal Nutrition, who expressed the belief that "nutrition investigations are falling behind other branches of agricultural science"—that there had not been a comparable scientific activity in comparison with other departments in the field of agriculture. Other speakers before that society have recently expressed a similar view; and such a conclusion would seem to be a fair deduction from the output in the form of publications.

This impression applies not only to the amount of fundamental investigation in animal nutrition, but to the character and progress of the ordinary experimental work. Not that there has not been an increase in the amount of advanced work, and an improvement in many of the common feeding experiments, but that relatively the improvement has been small. With the progress of experiment station work and the larger emphasis on investigation, it seemed reasonable to expect that more institutions should feel the need of departing from the conventional range of feeding experiments and more men representing animal husbandry at the stations should feel impelled to prepare for advanced and productive inquiry.

With some notable exceptions, the work in animal husbandry is to a considerable extent at a standstill. The easier things have been done. The more difficult and constructive stage has been reached, but there has not been a very large rising to the emergency. It is only rarely that a feeding project of Adams fund grade is submitted nowadays, but the experiments of conventional type go on apparently without end and, it is feared, without marking much permanent advance.

Quite a proportion of the feeding experiments still deal only with the economic and commercial phases of the subject, or with comparative values and effects; and as economic conditions are constantly changing and vary in different localities, the results lack

permanent or widely applicable value. Hence it is that the necessity is felt for going over much the same ground at frequent intervals and in different localities. And while this is not without value to the farmer it often represents an unnecessary waste of effort, and stands in the way of what might mark more real progress. Essentially the same kind of experiments are often repeated by stations in the same general locality, and with full knowledge of such repetition, as was the case a few years ago when silage was being tested for beef production. The result in such cases becomes largely a local demonstration rather than the acquisition of new information. In fact, the statement has often been made that the work was done to convince the farmers of the locality of the truthfulness or application of work in other States, the thought being that they had a different feeling if the experiments were made under their conditions.

There is undoubtedly much merit in the conventional feeding experiments and in experiments which interpret the best experience of the locality. But such experiments should profit by what has gone before, and should show improvement in method and in the extent to which the results contribute to a more complete understanding of the general subject. Manifestly the experimental results must be secured under such conditions as to insure accuracy and reliability within reasonable limits, and to make possible the comparison of the results with other experiments. At present there is the widest variation in experiments of this class. Between the feeding trial that deals only with the gross effect as measured by lots, and the more refined experiment which carefully guards and controls the conditions and results as applied to individual animals, and seeks the reason in the changes which actually take place, there is a wide gap. One is the rough comparison such as a feeder might make, if he had the time, and the other represents an attempt to trace the true relation between cause and effect.

It would seem that we should have largely passed the stage of the first type mentioned, but the publications and records of work in progress do not show this to be the case. Such trials, with all their crudeness, meet a popular demand and this demand is being acceded to despite the development of demonstration and extension work. Unfortunately there are some indications that the latter is already constituting a new demand for superficial work. This more direct teaching of the farmers brings out local problems in increasing numbers, and makes an urgent call for very practical and didactic directions which have behind them the force of local experimental trials.

But the experiment station can not afford to look at the subject of feeding from the superficial and local standpoint, and it is hardly its function to make experiments to demonstrate locally what is already known. Extension work will be an actual disadvantage to

experimentation if this requirement is pressed beyond reasonable bounds, and the extension worker must realize the need of thorough-going work.

A thorough understanding and sympathetic relation between the station men and the extension men is highly desirable. The latter coming in more direct contact with the farmers are in position to explain the station's work and to justify its position. They are also in position to call to the station's attention, in a discriminating way, larger questions in animal feeding which need study. But the extension men must be reasonable in their expectations of the stations, and they must also realize that after all the chief object of extension teaching is to enlighten the farmer and to help him in making himself more resourceful. Rules for farming to be followed blindly and implicitly can rarely be developed, and would be a serious detriment to the men engaged in the industry if they could be supplied; while carefully made and interpreted experiments can develop facts that will be of wide application, which may be tested out and adapted to the region. But the demonstration of such facts for the information or convincing of the farmers is a matter for the extension department. Such demonstrations will frequently embody some experimental features, since it is rarely possible to adapt locally the teachings of the stations without some special modifications which arise from local conditions. This is invariably the case in everyday life. Matters of convenience, expediency, personal preference, etc., modify human conduct. Similar considerations will inevitably modify the local practice in agriculture which the extension department will succeed in implanting.

The case of the usual feeding experiment is clearly and fairly set forth in the recent bulletin of Mitchell and Grindley of the Illinois Station. In reference to experiments comparing the fattening effect of systems of treatment, etc., the authors say: "Our knowledge of the principles of animal nutrition is too fragmentary to enable us to foretell with certainty, except when greatly dissimilar, which of two rations for instance will produce the more rapid or the more economical gains in weight for a particular kind of farm animal, no matter how clearly defined or completely analyzed the results may be. Actual experiment with those particular rations is generally essential to a satisfactory solution of the problem. However, the information thus obtained has at best a very limited application to other rations or other conditions, so that such feeding experiments ordinarily contribute little of fundamental importance to the science of animal nutrition."

Although the plan of such feeding experiments is simple, the results are often ambiguous and require much care in their interpreta-

tion. This is common to all experiments concerned with the functional activity of living organisms, and is due to the uncertainty of their following exact rules of uniformity, i. e., to what we designate as individuality.

Mitchell and Grindley have presented a most interesting and suggestive study on this element of uncertainty in the interpretation of feeding experiments. It is one of the most effective critical studies of any branch of our station work, and should be very helpful in directing attention to the improvement of experiments of this class and their interpretation. The bulletin illustrates not only the danger to be guarded against from a scientific standpoint, but to an even greater extent when deductions are to be made for the guidance of the farmer, because the latter often can not impose the precise experimental conditions required.

Manifestly experiments of this class are crude and hence lacking in absolute accuracy. This should be recognized to guard against overconfidence and too broad generalizations; and at the same time the effort should be put forth to improve the methods both in planning and execution. As a first step we need to know for our own information the extent of the experimental error and its source. Until we do know this the necessity of improvement is not apparent and its means is uncertain. Refinement of certain stages of the feeding may be more than counterbalanced by the inherent errors due to poor selection of animals or some other defect. The extent of the experimental error is an index to the degree to which deductions can be safely drawn, and will indicate caution in making broad generalizations for the benefit of the practical feeder.

The extensive review of experiment station literature in the United States made by Mitchell and Grindley develops the nature and the source of the experimental error and points to methods of reducing it. They find an average coefficient of variation in gain of about twenty-one per cent for similarly treated lots of sheep and of about seventeen per cent for steers and swine. This points to the danger of small lots of animals and of uneven selection of individuals. As the authors say, "increasing the size of lots is no remedy for a poor selection of experimental animals," and "can not eliminate individuality by merely reducing its effect on the average." Further more, "the necessity of selecting homogeneous lots of animals is not appreciably diminished by the balancing of heterogeneous lots."

The critical analysis represented by this bulletin points out the inherent weakness of such experiments, as commonly made, and the need of more scientific and dependable methods in our present feeding trials. They are not all that they should be or might be made and they are not all that we have assumed them to be. Whether

or not the more abstract research in nutrition is entered upon, experiments for the benefit of practical feeding should carry all the conviction which accuracy of plan and method and judgment in interpretation can make possible.

Some improvement is to be noted in the feeding experiments of recent years, but it is doubtful whether an increasing proportion of such experiments are made under more exact and better-known conditions than formerly—whether the individual records are taken, the feed subjected to analysis, the limits of experimental error considered, and other refinements observed. Indeed, there seems in a considerable number of cases to be less regard for these factors than formerly.

Furthermore, there does not appear to be a very critical attitude toward these feeding experiments by many of the men who make and apply them—the animal husbandmen and animal feeders. The experiments are rarely weighed in the critical, discriminating manner that characterizes scientific work in general in the attempt to measure their true value and the advance which they mark. The expectations are less exacting, and the standard of requirements seems to change but little as time goes on. Apparently the need of a broader special preparation along scientific lines for experimental work in animal husbandry is not very generally felt, while the same importance as formerly is attached to the practical aspects of the subject, sometimes to the overshadowing of others. In other words, it would appear that the standards and ideals, and to some extent the preparation, for work in animal husbandry have not developed to the extent that they have in some other branches of agriculture, and that the setting off of the subject as a separate division and assignment of the feeding studies to it has not been followed by the general strengthening of the experimental work that is clearly desirable.

This is not said in any spirit of harsh criticism of the animal husbandman, or lack of appreciation of the requirements placed upon him. It is made rather as a comment on the condition and attitude which is believed to impede the progress in animal feeding, and is directed at the animal husbandman because he now has such an important relation to this progress. Not that he will necessarily be the one himself to conduct the research in a larger degree, but that as representing the head of animal husbandry work he must furnish much of the spirit and the encouragement and the defense for advanced study, and that his ideals will inevitably influence the character of his activities. If his attitude is not progressive and appreciative of work and methods which aim beyond economic considerations, such work will rarely flourish in his institution.

As a leader of sentiment in his field his influence as well as his actual direction of work is very broad. To him falls the application



and adaptation of the findings of experimental study and the presentation of them to the student and to the farmer. And on him rests in large degree the furnishing of the initiative.

Whether research flourishes or decays depends ultimately on the ideals and conceptions of the class it seeks to serve. If there is not a desire for it and an appreciation and belief in it which constitute a sustaining influence, it can not rise above the mediocre.

It is unreasonable to expect that the animal husbandman, more than the agronomist, will be alike investigator, teacher, and extension worker at the same time, but if he is to be assigned to the experiment station force he should be capable of taking an active and intelligent part in investigation. If he is to take a vital part, and not merely attend to the mechanical operations of feeding and handling the animals, it is not sufficient that his training should make him a good judge of stock and a successful feeder and breeder, but he must have an insight into the method and the spirit of inquiry, and familiarity with the progress of investigation in his field along the theoretical as well as the applied side. These things will require training in science beyond that given in the agricultural course. They mean special preparation for investigation and for its direction. Lack of training in animal physiology and other sciences which will open the way for broader inquiries will constitute a serious handicap to the animal husbandman as a station worker and necessarily impose limitations.

In the system of organization which is becoming common in our institutions, the animal husbandman may be called upon to outline and direct investigations within his department that involve the various branches of science concerned. Unless he is able to see the needs of such investigation, to suggest problems and points of attack and to make himself a part of the investigation, he will have only a passive relation to it and can hardly be expected to take a vital interest in it.

A well known investigator has said: "That researches directed to immediately practical results frequently fail to yield all that may be expected of them is largely due to the imperfections of the scientific work of the past, and so makes evident the importance of undertaking in the present purely scientific studies which will lead to more definite and valuable results when future experiments are directed to the solution of practical problems."

This is equivalent to saying that the practical efficiency of feeding trials depends on knowledge of the principles and scientific facts underlying nutrition. If our understanding of the principles of physiology and chemistry is deficient, it is impossible to account for or explain results secured in practical experiments, or to interpret

them intelligently—an experience which has not been unusual in the past. If, for example, in a practical feeding trial including equal amounts of protein materials from different sources different results are secured from those expected, we are thrown into confusion because having assumed all proteins to be alike we have no explanation to offer. The investigation of these bodies has made the experimental feeder more resourceful in planning and interpreting his work.

Dr. Armsby has well said: "If we believe at all in the utility of applied science, surely we must believe that a study of the intricate workings of the animal machine will yield results of practical value, even though we can not foresee in just what direction."

Animal feeding is by no means a matter of applied mathematics, as was long ago said, but there are certain physiological principles and laws which the animal body follows in the handling and utilization of food, and the knowledge of these must constitute the basis not only for the theory but for the right practice of feeding. It is reasonable to suppose that the necessity for investigation in this line should have impressed itself, and that there should have been a steady development in that direction, along with the experiments of more direct application.

It is clear, of course, that such questions as the maintenance requirements of animals, the interesting question of the influence of feed supply on growth, the protein requirements of farm animals, the functions of protein in the mechanism of the liberation of energy for work, can never be solved by the methods of the common feeding experiment. They call for all the resources of physiological investigation. They tax man's ability and ingenuity and perception to the utmost. The field offers all the inspiration of opportunity for the very best research ability. Some of these subjects and such questions as the constitution and nutritive value of proteins, the function and transformation of nucleo-proteins, and the metabolism of these and other bodies are being studied by physiologists and physiological chemists and not by the animal husbandmen. This is natural, and is immaterial as long as the latter take heed of the results of such work and apply them in their experiments and their teachings. It is not alone benevolent tolerance that is desired for such research, but intelligent and active support for it and a measure of participation in it by those who stand for animal husbandry.

The nature of the subjects which need to be studied and taken account of in their bearing on animal nutrition, and the trend of investigation under way, have been effectively set forth at several sessions of the Graduate School in a way to open up the broader relations of the subject, and also in the proceedings of the American Society of Animal Nutrition. Such study does not always require a

respiration calorimeter, although it calls for adequate laboratory equipment, and it is not necessarily beyond the means of an institution, although ordinarily expensive. Studies that would doubtless cost less than the customary feeding trials might well yield far more to enrich the body of established fact and make the next step possible. After all it is largely a matter of attitude and spirit, for with these the means will follow.

A by-product of nearly every serious investigation in feeding is a series of problems which are suggested as needing investigation. This is the experience of every keen investigator. He encounters questions which he needs light upon, and when he undertakes to search them out in the literature he finds they have not been solved—perhaps worked on fragmentarily by several men and then left in the doubtful stage, with an indeterminate degree of finality.

Many of the large questions in animal nutrition call for cooperation which will bring different branches of science to bear upon them. As President Waters has well said: "The animal husbandman must be content to share the plan, the work, and the credit with other departments of the station. The besetting sin of our present organization of the experiment station and the cause of much of our superficial work is the unwillingness or incapacity of our men to combine themselves into a team and attack a problem as an institution rather than as an individual or as one small department of the institution. . . . We constantly are seeking the lines of cleavage between departments of the station when we should be seeking the means of knitting them together into one whole. The latter is the modern practice of well-organized team work, the former ancient and inefficient individualism." The animal husbandry department furnishes the nucleus, and many will furnish the problems, around which such effective cooperation may be organized.

Cooperation among institutions working along a common line offers many opportunities for helpfulness. A plan for such cooperation was outlined by the Committee on Experiments of the American Society of Animal Nutrition several years ago, to include an investigation upon the optimum protein supply of fattening cattle and the digestibility of feeding stuffs with pigs. Thus far, aside from a passing interest of the members of the society, the results have been largely negative and the proposal has not met with the response that was hoped for. However, the committee reported at the last meeting of the society that it still believed the plan "will be of considerable service to experiment station workers in the attempts to solve some of the problems of animal nutrition." It deserves to be tried. The accumulation of a body of comparable data secured in accordance with a common plan and purpose would be an important step and would mean far more than separate, and

pendent experiments which embody nothing in common and are incapable of comparison or combination.

The importance of the subject of animal feeding merits the very best effort which the experiment stations are capable of commanding. The conventional experiments have served a very useful purpose and will continue to be needed, but they should be refined to give a greater degree of accuracy and should be subjected to more critical examination in their planning and their conduct. But beyond this, one of the ultimate objects of work in this field, as in every other, must be to make practice more intelligent and better understood. This calls for the determination of the reason for what is found in experiment and observed in good practice. Without this the theory of feeding can not be developed and the more practical experiments can not reach their highest degree of reliability or usefulness.

One of the greatest needs is more men of training who can see the field in its broader aspects and develop a point of attack. Especially, there should be no question of the encouragement and defense of the higher types of work by the men in charge of animal husbandry in the agricultural colleges and experiment stations.

## RECENT WORK IN AGRICULTURAL SCIENCE

### AGRICULTURAL CHEMISTRY—AGROTECHNY.

In regard to the constitution of albumin, R. CHODAT (*Abstr. in Chem. Ztg.* 36 (1912), No. 52, p. 487).—A special reaction is described which is supposed to be characteristic of the  $\alpha$ -amino-carboxylic acids of the fatty series, peptids, simple or complex peptid chains, polypeptids, peptones, albumoses, and soluble proteins. The method is as follows: A purified tyrosinase is allowed to act upon a phenol; i. e., p-cresol, pyrocatechol, etc., in the presence of equimolecular or multiple quantities of an amino acid, a peptid, or a polypeptid. The reaction is indicated by a red coloration which changes to a violet green and finally to a blue having marked red dichroism, and is very sensitive.

The following among other substances were studied: Glycocoll, D- and L-alanin, D-valin, D- and L-leucin, phenylglycin, D- and L-tyrosin, D- and L-phenyl-alanin, arginin, and cystin. Anthranilis acid does not react, but with tryptophan and pyrrolidincarboxylic acid a stronger coloration is obtained. Peptones and albumoses give a marked coloration which becomes stronger as peptonization proceeds. The color is also marked in the case of albumins, pure globulins, nucleo-globulins, and other proteins. The reaction will also show a change in the condensation or alteration in the composition of the original protein. As the reaction is specific for amino acids, it determines without going any further the presence of  $\text{NH}_2$  and  $\text{COOH}$ -groups.

A preliminary note on the coagulation of proteins by ultraviolet light. W. T. BOVE (*Science, n. ser.*, 37 (1913), No. 946, pp. 24, 25).—In order to gain insight into the action of ultraviolet light on living cells, tests were conducted with ordinary egg albumin, crystallized egg albumin prepared according to the Hopkins and Plunkus method, egg albumin (Hopkins and Plunkus) dialyzed against tap water, and ox serum.

In all instances the albumin was more or less coagulated, and in the case of the egg albumins the coagulum produced was insoluble in alcohol, hot or cold water, and dilute acids, but soluble in dilute alkalis. In these respects it corresponded to the coagulum produced by heat alone.

New investigations in regard to our knowledge of fats, R. LIMPRICH (*Neue Untersuchungen zur Kenntnis der Fette. Inaug. Diss., Univ. Münster, 1914, pp. 89, figs. 9*).—The first part of this work embraces a study of methods for determining the presence of beef or mutton tallow in lard. It describes a new method for this purpose, and gives the results of a study of the Polenske method and its theoretical foundations.

The second part deals with heptadecylic acid and triheptadecylene, the former having been previously found by other investigators to be present in lard in the form of a glycerid. An attempt was made to prepare the heptadecylic acid synthetically and to compare it with the compound occurring in lard.

The third part of the dissertation gives the results of some feeding experiments with carp, with special reference to the influence of the fat given in the food on the body fat of the animals.

**Reducing power of sugars (monosaccharids), and its bearing on the definition of these substances,** N. SCHOORL (*Chem. Weekbl.*, 9 (1912), No. 35, pp. 706-711; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 600, I, p. 750).—The introduction of a nonoxidized carbon atom between the  $\text{CO}$ - and  $\text{CH(OH)}$ -groups in a compound containing the group  $\text{COCH(OH)}$ , diminishes the reducing power materially toward weak alkaline copper solutions. The author maintains that the term "sugar" should include all substances containing the group  $\text{COCH(OH)}$ -, whether they are polyhydric alcohols or not.

**Studies in regard to plant colloids.—I, Swelling of the starch solution in the presence of crystalloids,** M. SAMER (*Kolloidchem. Beihfte.*, 3 (1911), V, 3-4, pp. 123-160, figs. 7).—The presence of a crystalloid seems to change the swelling of starch granules in lower concentration than was usually supposed. This is apparently due to the anions, and the cations have only a quantitative influence upon the action exerted by the anions. The influence of the inorganic and organic crystalloids, glucose, urea, chloral hydrate, glycerin, etc., upon the swelling process of starch and gelatin with few exceptions is identical.

The stimulation of swelling for the ions investigated is a periodic function of the atomic weight of the respective element. Classification according to the nature and intensity of the swelling process leads to the figures obtained by Paull and Hofmeister. The swelling induced by certain salts was found to be reversed with an increase in temperature. Salts yielding OH on cleavage in medium concentrations seem to induce swelling.

Acids do not show as great a sensitiveness toward starch as salts. The same conditions for swelling hold for acids as for salts, and, in addition, the condition of the solution (solvate) is modified by the respective acid. Bases stimulate the swelling in highly dilute solutions, and in the lowest concentrations alkali hydroxids show the greatest influence in this direction. The curve (swelling) of most salts points to the formation of ion-adsorption compounds with starch, while the swelling produced by alkali hydroxids can be explained in the light of Paull's theory of ion hydration. The influence which other crystalloids exert upon starch appears also to be due to lyotropic activities.

**On the starch of glutinous rice and its hydrolysis by diastase,** Y. TANAKA (*Jour. Indust. and Engin. Chem.*, 4 (1912), No. 12, p. 318). This presents corrections of an article previously noted (*E. S. R.*, 28, p. 407).

**Investigations in regard to the formation of enzymes.—VII, About the development of certain yeasts in various nutrient solutions,** H. ERLER and B. PALM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 1-2, pp. 59-70, figs. 6).—The results show that the quantitative multiplication of cells of *saccharomyces cerevisiae* (beer yeast), *S. apiculatus*, and *S. marssonii* in a solution of an unfermentable disaccharid and fermentable hexose proceeds in the same manner. Apparently yeasts contain hydrolyzing enzymes for certain disaccharids, the fermentation of which can not be determined by existing methods.

The nutrient solution in addition to the sugar was composed of 0.25 gm. of magnesium sulphate, 5 gm. of orthomonopotassium sulphate, and 4.5 gm. of asparagin and water to make 1 liter. The sugars studied were saccharose, glucose, galactose, and lactose.

*S. thermantimonum* was also tested in this regard but with negative results.

**Formation of alkali by enzymes,** C. NEUBERG (*Abs. in Zentbl. Physiol.*, 26 (1912), No. 16, pp. 715-717).—The fermentation of the potassium salt of pyruvic acid with yeast or yeast juice, prepared by von Lebedev's methods, resulted in the formation of carbon dioxide acetaldehyde and potassium car-

bouate. The same fermentation can be produced with the potassium salt or oxalacetic acid.

The biological analysis of casein antiserum, A. KLEIN (*Folia Microbiologica* [Delft], 1 (1912), No. 1-2, pp. 101-162, table 1; *abs. in Mûlchec. Zentbl.*, 41 (1912), No. 23, pp. 720, 721).—The antiserum used in these investigations was prepared by injecting casein solutions into rabbits. It was invariably found that 2 kinds of precipitins were produced, which had the following distinguishing features:

Calcium casein precipitin acts exclusively in the presence of calcium chlorid with an optimum activity at a concentration of 5 parts per thousand. Casein precipitation is the most complete when calcium chlorid is absent, and the precipitation decreases as the calcium chlorid increases. Calcium casein precipitin shows an optimum activity with 2 mg. of casein, and casein precipitin with 0.1 mg. of casein. Both of the precipitins are weakened by diluting the serum with physiological salt solution, or by adding an alkali, but casein precipitin is the more affected. The addition of water to fresh antisera produces a precipitate in casein sera, but not in calcium casein sera. As the antisera grow older, or are heated to 55° C., casein precipitin loses some of its precipitating capacity; no such effect is noted with calcium casein precipitin. In the process of immunizing, calcium casein precipitin first makes its appearance in the sera. The calcium casein precipitation reaction obtained with the casein antisera and lactosera does not detect more than  $\pm 1/30$  mg. of casein. Casein precipitins do not detect more than 1/100 mg. casein, and in this respect resemble glycerin acetic acid. Casein precipitin also inhibits the action of calcium casein antiserum.

Some applications of lacto- and ovosera, B. GALLI-VALERIO and M. BONNARE (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 14 (1912), No. 1, pp. 32-41, fig. 1, *abs. in Centbl. Bakt. (etc.)*, 1, Abt. Ref., 55 (1912), No. 8, p. 233).—With a lactoantiserum it was possible to detect casein, particularly in feces and in fish. Likewise it was possible with a fowl antiserum to detect eggs in various foodstuffs.

A contribution to our methods of determining nitrogen in humus, C. B. LIPMAN and H. F. PRESSEY (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 143, 144).—While much work has been done in regard to methods for determining humus in soils, very little appears to have been reported with reference to the determination of nitrogen in the humus. To obtain a more uniform and reliable method for determining nitrogen, the Welfarth, Gunning-Atterberg, Hibbard, and salicylic acid methods were compared. The soils from which the humus solutions were obtained included light sandy soil from a walnut orchard, Anaheim, Cal., with a humus content of 0.55 per cent; silty clay loam derived from the State of Washington, humus content 8.89 per cent, and tulle soil from an island in the Sacramento River, nearly all organic matter, humus content 28.7 per cent.

The Hibbard method gave the highest amounts of nitrogen in all cases except one, thus showing a more thorough digestion, and its duplicate and triplicate determinations showed the best agreement. The digestion was carried on more rapidly than in any other method, and particularly than by the salicylic acid method which, in other respects, came the nearest to the Hibbard method in yielding satisfactory results. Considerable trouble with bumping was experienced with all methods except the Hibbard, in which the digestion proceeded rapidly and quietly in all cases. Its manipulation also surpassed in simplicity and speed all the other methods tested. "In view of the fact, therefore, that the Hibbard method is far superior to the others so far as both accuracy and speed are concerned, its use is urged in all humus nitrogen determinations."

**A comparison of some qualitative and quantitative methods for carbonates in soils.** E. W. GAITHER (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 2, pp. 138-143, figs. 4).—The author finds that methods which boil soils with mineral acids at 100° C. for determining the carbon dioxide content of the soils are inaccurate as a measure for carbonates in soils, because often the organic matter present in the soil is decomposed by the acid treatment, and results in the evolution of carbon dioxide. This confirms the findings of Marr (*E. S. R.*, 22, p. 511). If, however, the soils are boiled in a partial vacuum at 50° with dilute mineral acids, no decomposition of organic matter takes place, and the evolved carbon dioxide is representative of the carbonates present.

The litmus paper test, when properly conducted, was found to be the best qualitative test known for determining the presence of native carbonates in soils from humid regions. On the other hand, some soils may give an alkaline reaction not due to carbonate but to the products resulting from the hydrolysis of certain minerals which exist in soils, as pointed out by Cameron and Bell (*E. S. R.*, 17, p. 742). Although the reddening of blue litmus paper may be due to the absorption of the base from hydrolyzed litmus salt, the presence of native carbonates in soils can either prevent this selective absorption, or it may cause an interchange of bases to take place. If a native carbonate, which is capable of being decomposed by weak hydrochloric acid at a low temperature, is present in the soil, it is indicated by the bluing of red litmus paper. If no alkalis or basic materials are present which yield alkaline solutions, a reaction is obtained with blue litmus paper.

Soils containing substances which reddens blue litmus paper have a tendency to the formation of acids or acid salts, which unite with the base absorbed from hydrolyzed litmus and fail to return another base in its stead. This results in the reddening of the indicator even though no hydrogen ions are yielded to a water solution. It is possible that the soil is capable of producing a physiological action which is similar to that produced by stronger acids yielding hydrogen ions to aqueous solutions.

**Polarization before inversion in the examination of molasses by Clerget's method.** J. J. HAZEWINKEL and C. LOURENS (*Médec. Profstat. Java-Suiker-indus.*, 1912, No. 21, pp. 635-637; *Arch. Suikerindus. Nederland, Indië*, 20 (1912), No. 27, pp. 1073-1075).—The method recommended is as follows: One-half of the normal weight of the molasses is taken in a 100 cc. flask; then 10 cc. of a solution of neutral lead acetate is added, filled up to the mark with water, from 3 to 5 gm. of bone black added, shaken, and filtered. The polarization is done in a 200 or 400 mm. tube.

**The freezing point of milk.** J. B. HENDERSON and L. A. MESTON (*Proc. Roy. Soc. Queensland*, 24 (1913), pp. 165-180, pl. 1).—With a view to determining a reliable method by which the addition of water to milk could be detected, tests were made of the freezing point of milk under a variety of conditions. Results indicated "(1) that the freezing point of pure fresh milk samples from herds of cows in southern Queensland never shows a greater variation than from 0.56° to 0.58° C., the mean being 0.555° (this is exactly in accord with Continental experience); and (2) that the freezing point determines with accuracy the proportion of water added to any milk from a herd, and distinguishes with absolute certainty the watered rich milk from the naturally poor milk."

**A new scale for determining moisture in butter.** E. WÜRKNER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 24 (1912), No. 12, pp. 741, 742, fig. 1).—A description and illustration of the apparatus are given.

**A simple test for the determination of butter fat in butter.** J. M. DOZAN (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 11, pp. 841, 842, fig. 1).—The method, which simply serves as a control test for the chemical method, is con-



ducted as follows: "The sample of butter, taken with a trier or otherwise, is first warmed to about 100° F. and thoroughly stirred to insure the mass being uniform. About 10 cc. of the sample is placed in a sedimentation tube and whirled in a [hand] centrifuge for a few seconds. The sample should be sufficiently liquid in order to insure a good reading after being whirled in the centrifuge. After reading the amount of the sample on the tube scale, about 5 cc. of gasoline is added and the tube carefully inverted 2 or 3 times, holding the thumb or finger over the top of the tube. Let the solution of fat and gasoline drain a few seconds before removing the finger. Place the tube in the centrifuge and whirl again for 15 or 20 seconds.

"The gasoline dissolves the fat, forming a clear layer on the top. The non-fats, that is the water, salt, and curd, being immiscible with the gasoline and also heavier, form the lower layer. The second whirling drives the nonfats to the lower end of the tube almost completely, at the same time forming a sharp line of division between the 2 layers. The amount of nonfats is then carefully read on the tube scale. . . .

"Care should be taken that this test is made at a fairly uniform temperature in order to eliminate as far as possible the changes in relative volumes due to variations in temperature. In case the sample when first placed in the sedimentation tube is not sufficiently liquid to insure a good reading on being whirled, it may be warmed by placing it in water or in an oven for a few minutes at a temperature not over 110°."

The method yields slightly higher results than the official method.

A simplification of the method for determining the Reichert-Meißl and Polenske numbers. A. Goske (*Ztschr. Untersuch. Nahr. u. Genussmittel*, 24 (1912), No. 4, pp. 274-276, fig. 1).—The apparatus consists of a boiling flask, a distilling tube (1 bulb), a Liebig condenser with a flared upper end, a funnel, holding a piece of filter paper, attached with a cork to the lower end of the Liebig condenser, and a 110 cc. receiving flask divided into 10 cc. divisions. The advantages claimed for this apparatus are that (1) filtration after distillation is unnecessary; (2) filtration is done directly in the 110 cc. obtained; (3) rinsing of the apparatus is eliminated, and in this way the losses observed in the usual procedure are avoided; and (4) no special preparation of the filter is necessary for the second determination.

Estimation of essential oil in mustard, D. Raquet (*Ann. Chim. Analyt.*, 17 (1912), No. 5, pp. 174-178; *abs. in Analyst*, 37 (1912), No. 436, p. 369).—It is pointed out that mixing mustard with water previous to distillation and allowing it to stand for some time is often followed by inconcordant results. Micro-organisms develop and exert their activity under these conditions, which results in the loss of oil. "If, however, dilute alcohol be used in place of water, the digestion may be allowed to proceed for even 24 hours without loss of essential oil. Having regard to these conditions, the following method is recommended for the estimation of the oil:

"Five gm. of the mustard flour is mixed in a 250 cc. flask with 100 cc. of water and 20 cc. of 90 per cent alcohol; the flask is now closed and set aside for 6 hours, or heated to a temperature of 35° C. for 1 hour. The contents are then distilled, and 50 cc. of the distillate is collected in a 100 cc. flask in which 10 cc. of ammonia have been placed previously; 20 cc. of tenth-normal silver nitrate solution is now added, the distillation is continued until the 100 cc. flask is filled nearly to the mark, and after the flask has been closed with a stopper carrying a long glass tube, the contents are heated to 85° for 1 hour. When cold, the mixture is diluted to 100 cc., filtered, and the excess of silver is titrated in 50 cc. of the filtrate by means of tenth-normal thiocyanate solution after the addition of nitric acid. The number of cubic centimeters of

tenth-normal silver nitrate used is multiplied by 0.198 to obtain the weight of allyl thiocarbimide in 100 gm. of the mustard. The following percentage quantities of mustard oil (as allyl thiocarbimide) were found in samples of black mustard of different origin: English, 1.39, Greek 1.20, French 1.08, Sicilian 0.99, Italian 0.99, and Bombay 0.81 per cent."

**Official methods of analysis adopted by the Texas Cotton Seed Crushers' Association** (*Oil, Paint and Drug Reporter*, 82 (1912), No. 6, p. 326).—The methods are for moisture, oil, ammonia and protein nitrogen, total fatty acids, and refinery losses.

**Method for determining the amount of cotton-seed hulls in cotton-seed meal.** C. J. KOLE (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwraproefstat.* (Netherlands), 1912, No. 12, pp. 34-47).—It is not deemed possible to obtain a good separation of hulls and meal body by sifting. Determining the crude fiber may give a clue as to whether a large or a small amount of hulls is present in the meal, but the results obtained are not accurate.

The National Experiment and Seed Control Station of Holland, located at Wageningen, uses the following method: Five gm. of the sample is treated in a cylinder with 300 cc. of boiling water and allowed to stand for at least 4 hours. The supernatant fluid is then poured off, and the residue is brought upon a piece of gauze (15 by 15 cm., mesh 10 microns) with the aid of a stream of water. The 4 ends of the gauze are brought together and the mass kneaded with the fingers for the purpose of reducing its size. The mass is then washed back into the cylinder, and when the hulls have sunk the fluid containing the floating particles of meal body is poured off. The cylinder is filled again with water, and when the coarse particles of hull have subsided, the supernatant fluid containing the fine particles of shell and coarse particles of meal is transferred to the gauze. The mass is then rubbed up in a mortar and transferred again to the cylinder. These processes are repeated until all meal body has been removed, when the residue, representing the hulls, is dried. The weight of these hulls is multiplied by an empirical factor  $100 \div 72$ , which gives the amount of hulls present in the sample.

It is stated that cotton-seed meal commonly contains about 15 per cent of hulls.

**The determination of formaldehyde.** E. RIMINI and T. JONA (*Glor. Farm. e Chim.*, 61 (1912), No. 2, pp. 49-56; *abs. in Chem. Ztg.*, 36 (1912), No. 87, *Repert.*, p. 401; *Chem. Zentralbl.*, 1912, I, No. 14, p. 1447).—Riegler's method, based on the conversion of formaldehyde into formalazin by the addition of a known amount of hydrazin, decomposing the excess of the latter with iodic acid and measuring the resulting nitrogen, is deemed inaccurate because formalazin is also decomposed in an acid solution. Consequently the author decomposes the hydrazin in an alkaline solution in which formalazin is perfectly stable. Potassium iodate can not be used instead of iodic acid.

**Extraction of oil by aspiration.** J. CHAPPELLE and J. RURY (*Jour. Agr. Prat.*, n. ser., 24 (1912), Nos. 48, pp. 686-688, figs. 2; 49, pp. 719-721, fig. 1).—A detailed description of a method for depriving olives of their oil by aspiration. The machinery required is illustrated.

**The effect of kiln drying at 145° F. on the composition of the hop.** H. V. TARRAR and B. PILKINGTON (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 11, pp. 839, 840).—The proper temperature to be used in the kiln drying of hops still being a question in dispute, the authors were prompted to repeat in a limited way some of the work which has been reported by other investigators. For this test 7 samples of Pacific coast hops were used. The temperature used in kiln drying in each instance varied between 120° and 145° F., the latter being the one which is preferred at the present time by Oregon hop growers. "The

drying was begun at the lower temperature and then gradually raised to 145°, at which temperature it was held as nearly as possible until the hops were dried. The temperature was taken with thermometers which were kept just under the floor of the kiln and at that portion of the kiln where the temperature was highest." The kilns employed were, with one exception, ordinary stove kilns, and were representative of those in common use. Comparisons were made with samples of hops which were air dried at room temperature. The determinations made were water, total resins, hard (gamma) resin, beta resin, alpha resin, tanulin, and wax.

"The results indicate that there was little if any change in the composition of the hops during the kiln-drying process. It will be noted that [with the exception of 2] samples, the amount of hard resin is slightly greater in the air-dried samples, a result which may be due to the variation in different samples. There was evidently little if any change in the amounts of tanulin and wax, considering the possible variation in separate samples. A physical examination showed that the difference in the aroma of the air-dried and the kiln-dried samples was hardly perceptible, different judges varying somewhat in their opinions."

See also previous work (E. S. R., 27, p. 844).

Notes on expressed and distilled West Indian lime oils, H. A. TEMPEST and N. GREENHAGHT (*West Indian Bul.*, 12 (1912), No. 4, pp. 498-503).—This gives the results of examining 7 samples of hand-expressed oils and 3 of distilled oils, in which were determined the specific gravity at 30° C., the optical rotation in a 100-mm. tube at 31°, the refractive index at 32°, the citral content by Burgess and Child's method, and the acid value by titration of 5 cc. of the oil dissolved in alcohol with seminormal alcoholic potash in the cold.

In regard to the expressed oils, the results show a somewhat wider divergence between the character of the different oils than is indicated by various authorities. The values for the optical rotation are lower than would be expected, probably because of the expansion of the oil owing to the high temperature at which measurements were made. The citral content and the acid number showed a fairly close correlation but varied markedly in different samples. The citral determination seemed to give satisfactory results. The amount of citral found varied markedly in the different samples, but was lower than is found in lemon oils, which, according to Gildemeister and Hoffman, contain from 7 to 10 per cent of that constituent.

With regard to distilled oils, the samples appeared to be characterized, as the whole, by a lower refractive index, citral content, and acid number, and in some cases a lower specific gravity. The rotation, on the other hand, was in all cases somewhat higher.

"From the above results, it would appear that during the process of distillation with steam (the conditions under which ordinary distilled oil is obtained being practically those of a steam distillation) a certain proportion of the lower and higher boiling constituents are removed. The blue fluorescence due to the presence of a crystalline substance in the higher fractions of the expressed oil is entirely absent in those of the distilled oils. This substance possibly may be the anthranilate which is known to exist in lime oil (Allen), the methyl ester of which,  $C_{11}H_{11}(N(CH_3)_2)COOCH_3$ . E. J. Parry<sup>a</sup> ascribes the blue fluorescence of mandarin orange oil. This is probably removed during the steam distillation.

"Expressed oil on standing generally deposits a pale yellow crystalline substance known as limettin. Distilled oils do not deposit this body. Limettin is

<sup>a</sup> Allen's Organic Analysis, 2 (1907), pt. 3, p. 40.

stated to be dimethoxycoumarin; it is readily soluble in hot water, and it is possible that distillation with steam effects the removal of the limettin itself, or of that constituent of expressed oils which by the action of light may be converted into limettin. (A sample of limettin recrystallized from boiling water was found to have a melting point of  $115^{\circ}$ )."

Investigations on the extraction of lime juice by milling, H. A. TEMPANY and V. M. WEIL (*West Indian Bul.*, 12 (1912), No. 4, pp. 474-478).—The problems connected with the extraction of lime juice as practised in the West Indies at the present time are in many ways not dissimilar from those encountered in obtaining the juice from the sugar cane. In fact, in many cases old cane mills have been adapted to the purpose of expressing lime juice, and so far as the actual extraction is concerned, the processes in the case of the 2 industries are identical. The efficiency of the mill is computed, as a rule, from the number of gallons of juice obtained from 1 bbl. of limes, but as the size of the barrels and limes, and the juice content of the limes was believed to vary, a test was made with a number of samples of limes from various localities.

"An examination of these results shows that the average weight and volume of a single fruit, as also the acidity of the juice, vary largely according to the locality in which the fruit is grown, the former characteristics varying directly and the latter inversely with the rainfall at the place of origin. The percentage of juice contained in the fruit, however, varies relatively little, amounting approximately to 62 per cent of the total weight of the fruit. This result is of a distinctly unexpected character, since comparison with the sugar cane would tend to the belief that the juice content would be materially less in dry localities. It follows from this that measurement of the extraction of juice, if accurately performed, will afford a reliable criterion of the efficiency of the milling in lime juice works."

Some tests in regard to the residue of juice left in the pressed skins were made, and showed that this was almost a complete check upon the efficiency of milling at the time the sample was taken.

Experiments in lime juice concentration, J. C. MACINTYRE (*West Indian Bul.*, 12 (1912), No. 4, pp. 465-472).—"The experiments in lime juice concentration which are described were carried out for the purpose of ascertaining the loss of acid occurring at various degrees of concentration so as to be in a position to judge whether the cost of steam-jacketed pans or other plant would be justified, and incidentally, to determine the point to which it is most economical to concentrate." A note by E. Watts is appended to this paper pointing out the practical value of the results obtained.

Index to *Zeitschrift für Analytische Chemie*, H. FRIESEN'S and A. CZAPSKI (*Zeitschrift für Analytische Chemie, Autoren- und Sach-Register zu den Bänden 41-50*, Wiesbaden, 1912, pp. 287).—An author and subject index of volumes 41 to 50, issued from 1902 to 1911, is given.

## METEOROLOGY—WATER.

Temperature coefficients in plant geography and climatology, B. E. and GACE J. LIVINGSTON (*Bot. Gaz.*, 56 (1913), No. 5, pp. 345-375, figs. 3).—This paper deals fully with a subject which has been briefly discussed elsewhere (*E. S. R.*, 28, p. 212; 29, p. 719). The direct temperature summations and summations of temperature efficiencies are charted and compared.

"For each of the direct summations, the normal daily mean minus 39, for the date next following the average date of the last frost in spring, is taken as the zero term. To this are added the normal daily means, each decreased by 39, for all dates up to and including the average date of the last frost in autumn. . . .

For the summations of temperature efficiencies, the normal daily efficiencies corresponding, respectively, to the normal daily means of Bigelow's tables have simply been added for the same days as in the direct summations, thus giving what may be termed a tentative index of temperature efficiency for growth during the normal frostless season."

The general conclusions reached are that "the method of direct temperature summations has proved itself to give, in a broadly general way and for most of the area of the United States, nearly the same climatic zones as does [the] method of efficiency summations. . . . The similarity between the results derived by these two methods of temperature integration, however, is only superficial and roughly approximate. The ratios of direct summation to efficiency summation range in magnitude, for the mean frostless season in the United States, from a minimum of 7.49 to a maximum of 10.44. A rational and consistent climatic chart represents the geographical distribution of these ratio values; on such a chart the marginal regions of the country are frequently characterized by low ratios and the two main mountain systems appear to control areas of high values. There seems to be no doubt that the ratio here brought forward quantitatively represents a climatic dimension or characteristic, which appears to be some sort of function of the daily normal temperatures upon which this whole study has been based and of the time distribution of these temperature data within the period of the mean frostless season."

**British rainfall, 1912,** H. R. MITT. and C. SALTER (*London, 1913, pp. 32, pls. 4, figs. 87*).—This report summarizes observations at 5,272 stations in Great Britain and Ireland grouped by counties and river basins.

The mean rainfall during the year was 39.31 in., 23 per cent above the average for 35 years (1875-1909), for England; 56.19 in., 19 per cent above the average, for Wales; 49.01 in., 11 per cent above the average, for Scotland; and 44.06 in., 8 per cent above the average, for Ireland. Within the last 32 years for which comparisons are available, two only (1882 and 1903) have been wetter than 1912 in the British Isles.

The report contains special articles on the great rain storm of August 25-26, 1912; the wettest summer in England and Wales; and the "Seathwaite" pattern rain gage.

**Evaporation from a plain water surface,** J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 3 (1913), No. 1, pp. 15, pl. 1, figs. 2; abs. in Internat. Ind. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1912), No. 8, pp. 1186, 1187*).—A description is given of the evaporimeter in use at Pusa, which consists essentially of a circular cement tank 6½ ft. in diameter and 5 ft. deep, with an adjustable pointer for measuring the water level. Records for 1911 and 1912 are tabulated and compared with other data obtained from the observatories at Madras and Lyallpur.

The rate of evaporation during the cold weather months was much the same at Pusa and at Lyallpur but was much higher at Lyallpur throughout the six hot months from May to October. At Pusa during the hottest months the rate of evaporation was three times that of the coldest months, at Lyallpur five times, and at Madras not quite twice that of the coldest months.

**Dew ponds and mist ponds,** E. A. MARTIN (*Rpt. Brit. Assoc. Adv. Sci., 1912, pp. 530, 531*).—An attempt is made in this article to explain the accumulation of water in these ponds. "The precipitation of mist into ponds, aided perhaps by silent discharges of electricity, and the entanglement of mist-laden salt dust in the hollows in which the ponds lie, are believed to be the means by which some ponds maintain a supply of water all through the year, in spite of the great draft which is made upon them by numerous cattle."

The artesian water supply of eastern and southern Florida, E. H. SELANDS and H. GUNTER (*Fla. Geol. Survey Ann. Rpt.*, 5 (1912), pp. 27-290, *pls.* 5, *figs.* 17).—This paper, which is the fourth of a series (E. S. R., 29, p. 315), includes a reprint of a paper on the water supply of eastern Florida (E. S. R., 25, p. 18), revised to include a report on the water supply of southern Florida. In the combined reports the artesian water supply is discussed in detail for each county lying in a section bordering the Atlantic and Gulf coasts, and comprising the principal artesian areas of Peninsular Florida.

Report of the interstate conference on artesian water, Sydney, 1912 (*Rpt. Interstate Conf. Artesian Water [Aust.]*, 1912, pp. XI+207+68, *pls.* 42).—The proceedings of this conference are reported. They dealt chiefly with the extent, methods of obtaining, and utilization of artesian waters for agricultural and other purposes in New South Wales. A number of maps, plates, and other data accompany the report.

## SOILS—FERTILIZERS.

Soil, soil investigation, and soil valuation, F. PAZ (*Monatsh. Landw.*, 6 (1913), No. 10, pp. 298-309).—The author reviews the physics and chemistry of soils and soil structure with special reference to the question of fertilization and the use of soil analysis in estimating the value of the soil for cropping purposes. He demonstrates that the kind, amount, and success of fertilization depend on the crop, the fertilizer content of the soil, the physical condition of the soil and subsoil, and other factors, such as climate, cultivation, etc., and points out that to the average farmer a chemical analysis of his soil means practically nothing. He suggests the need of keeping accurate records in each rural district of the physical and chemical conditions of the soils of each farm and of the other local factors affecting crops in order that each farmer may obtain definite and accurate information regarding the necessary mechanical and chemical treatment of his particular soil.

Chemistry, physics, biology, and cultivation of the soil, M. HOFFMANN (*Jahresber. Landw.*, 27 (1912), pp. 24-69).—Recent reports of investigations on this subject are classified and reviewed as usual.

Contribution to the study of the soils of the Republic of Argentina, P. LAVENIE (*An. Min. Agr. Argentina, Secc. Quim.*, 2 (1912), No. 2, pp. 577, *figs.* 6).—This article describes methods of soil sampling, mechanical, physical, and chemical analysis, and the methods of soil classification employed by the chemical laboratory of the department of agriculture of Argentina, and draws conclusions regarding the practical interpretation and application of the results of analysis. Analyses are reported of a large number of samples of representative agricultural soils from the different Provinces of Argentina, most of which show conditions very favorable to agriculture.

Soil culture in Iceland, P. M. GRUNER (*Arch. Biogéol.*, 3 (1912), No. 2, pp. 14-213, *pls.* 2, *figs.* 28).—This work reviews the natural history of Iceland in its relation to the formation of swamps and describes the swamps from the standpoint of their value as sources of peat fuel and as meadow lands. In addition there is a somewhat lengthy discussion of garden cultivation as practiced in Iceland, including descriptions of soils, fertilizers, crops, climate, and other factors closely related to this work.

The results of mixed cultivation with loam in Finland, A. RINDELL (*Jahrb. Work.*, 1 (1912), pp. 19-34).—A number of experiments were made in drained and burnt over peat swamps to determine the beneficial effect of adding different amounts of loam supplemented by phosphoric acid, potash, and lime as fertilizers.

The yield of grain was found to increase with increased loam addition. Fertilization with a mixture of phosphoric acid and potash further increased the yield, and somewhat more than fertilization with phosphoric acid alone, but with increasing loam treatment the difference in yields brought about by the two fertilizers steadily decreased. When practically the same experiments were made using sand instead of loam, the same general results were obtained except that the yields of grain were not nearly so large. The addition of lime showed little or no beneficial effect except where iron sulphid was present in the loam.

Comparative tests of lime and loam treatment of peat soils favored the loam, although the crop yield increased as the application of lime increased up to 2,570 lbs. per acre. It was found that repeated burning in case of certain peat swamps so reduced the nitrogen content that the crop yield was considerably lowered, making the addition of nitrogenous matter necessary.

The heat conductivity of damp sand and loam was found to be three or four times that of the peat. It was also found that loam treatment of peat soils sufficiently arrested frost action to allow plant life to exist in much colder weather. This is attributed to the better physical condition of the soil.

**Moor culture.** A. KOSTLAN (*Jahresber. Landw.*, 27 (1912), pp. 209-215, fig. 1).—Reports of recent investigations on this subject are classified and reviewed.

**The shrinking of swamp soils resulting from drainage and cultivation.** R. TACKER (*Jahrb. Moork.*, 1 (1912), pp. 35-45, pl. 1).—Attention is called to the marked shrinking and sinking of swamp soils resulting from drainage and other improvements. A sinking of from 15 to 25 per cent of the soil depth has been found to take place within 15 years after drainage in many swamps especially in those from which the peat has been stripped. The shrinking and sinking occur in layers and not as a solid mass.

The degree to which drainage so affects the soil is said to depend chiefly on the physical and chemical composition and depth of the soil, on the amount and depth of drainage, and on the character and condition of the subsoil. In some upland swamps which are drained and stripped of peat the bed soil sinks below the water level in the drainage ditches. To obviate this it is suggested that in stripping the peat a bed be left somewhat more than 50 cm. above mean water level in the ditches and this be mixed with sand to reduce the shrinkage. Cultivation of peat stripped soil reduces the shrinkage more than the sand treatment, but the productivity is said to be not nearly so great. The effect of drainage on such soils can best be determined by observing the relative movements of the layers and comparing their densities as determined before and at intervals after drainage.

Investigations on the influence of plant roots on the structure of the soil. M. HERKMANN (*Internat. Mitt. Bodenk.*, 3 (1913), No. 1, pp. 1-49, figs. 6).—A series of pot experiments with two representative soils, one a sandy soil containing considerable humus and little clay and the other a clay loam soil, were conducted over a period of two years to determine the influence of plant roots on the soil structure and also the effect of physical changes within the soil itself. The soils were prepared by tamping some and puddling others into place, and still others were experimented with in a loose mellow condition. Plants representative of the two general types of rooting were grown on some of the soils while others were left bare.

It was found that different kinds of soils, especially those rich in clay, are loosened not only by absorbing water but also as a result of the effect of frost, variations in moisture content, etc. In loose soils a very small percentage of the spaces is filled by the stronger tap roots so that there is no essential decrease in the original mellowness from this source. In compact soils roots may

to a certain degree improve the structure and thus increase production. In compact stiff soils, without granular structure, the loosening process is aided, to the benefit of plant growth, by the mechanical action of roots and by a strong modification of the moisture conditions. Roots apparently seldom make practical use of the so-called "root holes" as a means of spreading in heavy soils. The growth of roots as regards their mechanical action varies in loose and compact soils. The beneficial combination of self-loosening and root action explains the frequent permanent improvement of the soil structure under the continued influence of roots, as in grass lands, and also the prevention of permanent puddling of the soil by rain.

Further studies of the influence of vegetation on the penetration and movement of water in the soils showed a beneficial influence, especially in meadow and pasture lands where there is a marked surface spreading of the roots. Although in these cases the lateral percolation of the water was somewhat retarded by the roots, loss of water through evaporation was also retarded and a comparison of soils with and without vegetation showed that the water movement was much more rapid in the former. However, in grain lands covered with crops only part of the year, an injury resulted and the soil became hard and compact, making frequent cultivation necessary.

**The influence of subsoil loosening on soil yield.** *AGOSTINI (Illus., Landw. Ztg. 33 (1913), No. 32, pp. 303, 304, figs. 21.*—The opinion is expressed that the surface breaking up of a subsoil destroys capillarity, induces too much ventilation and drainage, and causes soluble plant foods to leach away. Cropping experiments on soil which had been completely subsoiled and on soil in which the subsoil had been broken only in a small furrow 3 cm. wide under each furrow were in favor of the latter method. Less power was expended in plowing by this method and it is stated that the looseness of subsoil lasts longer.

**The minimum water capacity of soils and its cause.** *A. MOSKOWICZ (Mitt. Landw. Lehrkanz. K. K. Hochschule, Bodenkult., Wien, 2 (1913), No. 1, pp. 209-244, fig. 3).*—The author reviews the results obtained by several other experimenters and gives the results of a number of his own experiments made to determine the cause and limitations of the minimum water capacity of soils.

On the basis of these results the author concludes that the minimum water capacity of soils is the maximum amount of water which is independent of gravity, or that amount which is adsorbed by a permeable soil under certain fixed conditions of vapor and air pressure and temperature when a surplus of water is added. He further concludes that under similar conditions of vapor and air pressure, temperature, stratification, and size of grain every soil except fibrous soil has a constant minimum water capacity. The difference between minimum and absolute water capacity of the soil increases as the soil becomes coarser grained. The minimum water capacity of the soil is determined by the adsorbed or condensed water, so that the greater the condensing surface presented within a soil the higher is the minimum water capacity. However, since the adsorptive power of different soil constituents varies, the minimum water capacity is not proportional to the surface presented but only to the free surface tension. In porous soils the larger part of the water not adsorbed drains away below, but nonporous soils, such as fine grained sands if the grains are of suitable shape, form pores with closed walls which retain large quantities of water, so that such fine sands in spite of their small adsorptive power show a high minimum water capacity. The minimum water capacity of a soil is not altered by crumbling but is increased by puddling, which increases the surface tension.

**Quantitative investigations on the reaction of aqueous extracts of soils.** *I. SANDER (Bul. Sect. Sci. Acad. Roumaine, 2 (1913-14), No. 1, pp. 38-44; abs.*



taking up of food from the soil by plants is thought to be effected by an exchange of ions.

The employment of dialysis and the determination of the power of oxidation as a convenient method for the judgment of soils, J. KÖNIG (*Festschrift 84. Versamm. Deut. Naturf. u. Ärzte von der Med. Naturf. Ges. Münster, 1912*, pp. 57-77, pl. 1, fig. 1).—See also the article noted above.

The soil solution and the mineral constituents of the soil, A. D. HALL, WINIFRED L. BRUNCHLEY, and LILIAN M. UNDERWOOD (*Phil. Trans. Roy. Soc. London, Ser. B, 204 (1913), No. 397, pp. 179-209, figs. 2*).—Wheat and barley were grown in solutions made from soils on which wheat and barley had been grown for 60 years. The growth in the solutions was parallel to that on the plots and the composition of the solutions as regards phosphoric acid and potash corresponded to the past manurial treatment and present analysis of the plots. Growth in the solutions from imperfectly manured plots was brought to the level of that in solutions of completely manured plots by the addition of suitable salts. "Wheat grew as well as barley in the solutions of the wheat soils and vice versa. In a similar set of solutions from the same soil the growth of buckwheat, white lupines, and sunflowers corresponded with that of wheat and barley. Boiling effected no alteration in the nutritive value of the soil solutions."

"In nutritive solutions of various degrees of dilution the growth of plants varied directly, but not proportionally with the concentration of the solution, though the total plant food present in the solution was in excess of the requirements of the plant. When the nutrient solution was diffused as a film over sand or soil particles, as in nature, there was no retardation of growth due to the slowness of the diffusion of the nutrients to the points in the liquid film which had been exhausted by contact with the roots. Growth in such nutrient solutions forming a film over sand particles was much superior to the growth in a water culture of equal concentration, but the growth in the water culture was similarly increased if a continuous current of air was kept passing through it."

"From the results obtained it is generally concluded: (1) The composition of the natural soil solution as regards phosphoric acid and potash is not constant, but varies significantly in accord with the composition of the soil and its past manurial history.

"(2) Within wide limits the rate of growth of a plant varies with the concentration of the nutritive solution, irrespective of the total amount of plant food available.

"(3) When other conditions, such as the supply of nitrogen, water, and air are equal, the growth of the crop will be determined by the concentration of the soil solution in phosphoric acid and potash which, in its turn, is determined by the amount of these substances in the soil, their state of combination, and the fertilizer supplied.

"(4) On normal cultivated soils the growth of crops like wheat and barley even when repeated for 60 years in succession, does not leave behind in the soil specific toxic substances which have an injurious effect upon the growth of the same or other plants in that soil."

The net result of these investigations is thought to uphold the theory of the direct nutrition of the plant by fertilizers.

Results of ten years' comparative field experiments on the action of fallow, manure, and clover. A. KOCH (*In Festschrift zum siebenzigsten Geburtstag von Jacob Esser, Berlin, 1913, pp. 57-93, figs. 3; Jour. Landw., 61 (1911) No. 3, pp. 245-281, figs. 3*).—Three systems of soil treatment were followed in the experiments reported in this article. These compared unfertilized fallow, fallow, manure (on potatoes or beets), and clover in a rotation of three crops.

winter wheat, rye, and oats or summer barley). The soil used in the experiments was a friable loam.

Detailed data for yield and value of the crops and the nitrogen content of the soil at different periods of the experiments are summarized. These indicate little or no decline of the nitrogen supply of the soil or of yield with bare fallow as compared with the manure and clover rotations.

The addition of cellulose to the soil as a source of energy increased the activity of bacteria which convert nitrates into albuminoid substances, and thus decreased the growth of crops. As soon as the cellulose was consumed, however, no further transformation of nitrates occurred and the plants began to make normal growth. The author concludes from this that nitrates are essential to plant growth in natural soils.

**Soil hygiene and green manuring**, F. ARNDT (*Mitt. Ökonomie. Vers. St., Sachsen*, 1912-13, pp. 29-79).—The author discusses soil moisture regulation and physical and chemical harmony in soils, and reports the results of his experiments made to demonstrate the value of legumes for green manuring.

**Report of the agriculturist**, E. F. GASKILL (*Massachusetts Sta. Rpt.*, 1912, pt. 1, pp. 21-34).—This is a report of progress in fertilizer experiments following the same general lines as in previous years, including pot and pot tests (U. S. R., 28, p. 325).

**The management of solid and liquid manures**, M. RINGELMANN (*Changement des Fumiers et des Purins*, Paris, 1913, pp. 187, figs. 163; rev. in *Rev. Sci. (Paris)*, 51 (1913), II, No. 7, p. 219).—This book deals very fully with the methods, structures, and appliances employed in the preservation and handling of farm manures, more especially liquid manures. The subject is considered from the sanitary standpoint as well as from that of practical utilization of the manures on the farm. Methods and appliances for distributing the manures and manure liquors receive particular attention.

**Enrichment of farmyard manure by cake feeding**, A. D. HALL (*Jour. Bd. Agr. (London)*, 29 (1913), No. 8, pp. 665-672).—On the basis mainly of experiments made at Rothamsted, but also from a study of farm accounts, the author concludes that the addition of oil cake to the feed of cattle enriches the manure with quickly available fertilizing constituents, but does not greatly increase its ultimate effect. He is of the opinion that the value of the practice of using cake is over-estimated, particularly in case of light soils.

**Comparative tests of lime nitrogen, nitrogen lime, sodium nitrate, and ammonium sulphate on sandy and upland moor soils**, R. TUCKER and F. BARNES (*Lond. Vers. Stat.*, 83 (1913), No. 1-2, pp. 1-166).—Pot experiments with different crops under a variety of conditions gave results indicating that the lime nitrogen prepared by the Frank and Caro process and nitrogen lime prepared by the Polzenius process are equally effective on sandy soils, but that the nitrogen lime is only about 81 per cent as effective as that of lime nitrogen on moor soils. The experiments indicated that neither product should be applied at the same time as the seed, as if applied at this time the fertilizing effect is only 41 per cent of that of sodium nitrate. Applied as a top-dressing the materials are from 66 to 67 per cent as effective as sodium nitrate in the case of rye and from 80 to 82 per cent as effective in the case of oats and potatoes. The best results were always obtained when the materials were applied a short time before seeding, when they were on the average 89 per cent as effective as sodium nitrate. The utilization of the nitrogen by plants was only 54 per cent of that of sodium nitrate on sandy soils and 67 per cent on moor soils.

**The lime-nitrogen industry**, E. O. SIEBNER (*Chem. Ztg.*, 37 (1913), Nos. 106, p. 1057, 1058; 108, pp. 1073-1075).—This is a brief review of the present status of the industry.

**Nitrogenous fertilizers obtainable in the United States, J. W. TURRENTINE** (*U. S. Dept. Agr. Bul. 37, pp. 12*).—Statistics of production and consumption for fertilizing purposes of sodium nitrate, ammonium sulphate, synthetic nitrogen compounds (calcium cyanamid and nitrate), tankage, and dried blood are summarized and discussed.

It is estimated that the use of these materials in fertilizers in the United States during 1912 was approximately as follows: Ammonium sulphate (production in United States 155,000 tons, imports 60,000 tons) 215,000 tons; sodium nitrate (about 13 per cent of the imports, 518,613 tons) 70,000 tons; calcium cyanamid 11,264 tons; tankage 93,324 tons; dried blood 37,710 tons; fish scrap 70,000 tons. See also a previous note (*E. S. R.*, 29, p. 517).

Figures are given which indicate that less than one-sixth of the recoverable ammonium sulphate lost in beehive coke ovens in the United States is now saved. Estimates by the Bureau of Animal Industry indicate that if all the slaughterhouse wastes were saved the possible production of tankage would be 222,535, of dried blood 79,794 tons.

**The replacement of potash in certain feldspathic rocks by substances used as fertilizers, C. ANDRÉ** (*Compt. Rend. Acad. Sci. [Paris], 157 (1913), No. 19, pp. 856-858; obs. in Rev. Sci. [Paris], 51 (1913), 11, No. 21, p. 668*).—The results reported by the author show the important rôle played by the phenomena of double decomposition which occurs when soluble fertilizing materials are added to the soil.

The replacement of potash by soda was especially marked when microcline was mixed with sea salt or with sodium nitrate, the amount of potash replaced being almost identical in the two cases. This replacement explains the favorable action of salt when used as a fertilizer. Sodium nitrate when applied to the soil is thus a means of furnishing a certain amount of potash to plants as a result of double decomposition in contact with particles of feldspar. Ammonium sulphate is also particularly active in replacing potash.

**Investigations on the composition of Thomas slag, M. PORR** (*Österr. Chem. Ztg., 16 (1913), No. 21, pp. 291, 292*).—Four different crystalline forms occurring in Thomas slag are described and their varying solubility in citric acid is discussed. Certain rhomboidal blue crystals occurring in the slag were found to be 95 per cent soluble in citric acid, while the brown columnar crystals found were only 41 per cent soluble.

In ground slag it was found that the finest particles had the highest percentage of phosphoric acid, silicic acid, and lime, and the lowest percentage of iron. Separating the coarser particles by means of an electromagnet it was found that the nonmagnetic part was almost identical in composition with the fine meal. While the phosphoric acid of the coarse particles, as a whole, was 13 per cent soluble, that of the magnetic particles was 20 per cent soluble.

A method of electro-dialysis was tried by which it was possible to separate the particles into groups corresponding to their solubility in citric acid.

**Investigations on the action of steamed and unsteamed bone as a phosphatic fertilizer in comparison with superphosphate and Thomas slag as well as on the importance of grinding unsteamed bone, B. SCHULZE** (*Land. Vers. Stat., 83 (1913), No. 1-2, pp. 101-150*).—In a series of pot experiments it was found that the phosphoric acid of Thomas slag soluble in citric acid was about 90 per cent as effective as the water soluble phosphoric acid of superphosphate the first year. Its utilization by plants was about 81 per cent of that of water soluble phosphoric acid. The after effects, however, in a measure compensated for the poor results the first year.

The effect of the phosphoric acid of bone meal during the first year was barely half that of superphosphate. In the course of three years the area

effect of the phosphoric acid of bone meal was about 60 per cent of that of water soluble phosphoric acid. The phosphoric acid of steamed bone meal was somewhat more effective than that of unsteamed bone; the results, however, varied with the plants grown. The difference in effect on cereals and on such crops as mustard, buckwheat, and spurry was especially marked. In no case, however, did the bone meal approximate in fertilizing efficiency the water soluble or citric acid soluble phosphoric acid.

Fine grinding of the unsteamed bone appreciably increased the fertilizing efficiency of the phosphoric acid.

The use of raw phosphate and siliceous lime as fertilizers, T. PRUEFER (*Zentbl. Kunstdünger Indus.*, 18 (1913), Nos. 21, pp. 457, 458; 22, pp. 473, 474).—Reviewing work by others the author concludes that raw phosphates may be profitably substituted for Thomas slag under certain circumstances, as, for example, on acid peaty soils, but that the conditions under which they are effective need to be carefully studied. The work of Immendorff and others shows that siliceous lime may be applied to soils without injury and even with profit under certain conditions.

Agricultural value of carbonate of lime recovered from causticizing plant, HENRICK (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, p. 741).—This material is described and field experiments with it are reported which showed that it compared favorably with other forms of lime as a fertilizer.

The action of quicklime on the soil, H. B. HUTCHINSON (*Rpt. Brit. Assoc. Adv. Sci.*, 1912, p. 749).—Observations are reported which show that the addition of small quantities of quicklime to field and garden soils stimulates general bacterial growth, but that large quantities cause an initial depression in the numbers of bacteria, the destruction of certain large protozoa, and a cessation of all biological processes. When the lime is converted into carbonate or combines with the soil constituents there is a great increase in the number of bacteria and acceleration of ammonification.

"The length of the period during which bacterial growth is suspended would appear to be determined by the quantity of lime applied, the initial reaction of the soil, and the amount of organic matter present.

"Pot experiments have been carried out with variously limed soils, and the results show close agreement with those obtained by bacteriological and chemical analyses."

Mineral and nitrogen contents of pine needles and straw, H. RAUER (*Ztschr. forst u. Jagdw.*, 45 (1913), No. 10, pp. 659, 660).—Analyses of needles and of straw of *Pinus cembra* in various stages of decomposition are reported. The percentages of ash and nitrogen were found to be very small but increased with the age of the material. The increase of mineral constituents with age and stage of decomposition was especially marked in the case of the lime. The ash on the other hand decreased with age.

Tobacco stalks as a fertilizer, H. D. HASKINS (*Massachusetts Sta. Rpt.*, 912, pt. 2, pp. 80-84).—This article gives analyses and discusses the fertilizing value of various samples of leached and unleached tobacco stalks. Stalks obtained in the so-called pruning system of harvesting the crop contained much more fertilizing matter than those obtained by stripping in the ordinary manner. Stalks which had been allowed to lie on the land during the fall and winter months had lost about 57 per cent of the total nitrogen and 51 per cent of the total potash.

Chemical industries of Belgium, Netherlands, Norway, and Sweden, T. H. MORTON (U. S. Dept. Com. and Labor, *Bur. Foreign and Dom. Com., Spec. Reports Ser.*, 1912, No. 65, pp. 85).—Data regarding the production of various

materials used as fertilizers and for other agricultural purposes are included in this report.

**Report of the fertilizer section, H. D. HARKINS** (*Massachusetts Sta. Rep. 1912, pt. 1, pp. 163-118*).—A brief account is given of the State fertilizer inspection and the character and quality of fertilizing materials used in the State, are discussed.

### AGRICULTURAL BOTANY.

**The action of certain nutrient and nonnutrient bases on plant growth, M. M. McCOLL** (*New York Cornell Sta. Mem. 2, pp. 115-216, figs. 15*).—This memoir consists of three papers as follows: (1) The antitoxic action of certain nutrient and nonnutrient bases with respect to plants, (2) the toxicity of manganese and the antidotal relations between this and various other cations with respect to green plants, and (3) toxicity of various cations.

Extensive studies on the toxic and antidotal action of various bases were made, and the chief conclusions which were derived from the experiments are that barium, strontium, ammonium, magnesium, sodium, and potassium were poisonous to seedlings in the order given. Mutual antagonism resulted when the following cations were present in solution: Magnesium and strontium, potassium and strontium, sodium and strontium, sodium and potassium, sodium and ammonium, potassium and barium, and magnesium and barium. Calcium was found the most effective of any of the substances studied in preventing toxic action. This protective action was found to be not confined to the so-called essential nutrients, as some of the nonessential ions possessed this property. The favorable results obtained from the application of lime to many types of soils is believed to be due in part to the antidotal relations.

In considering the toxicity of manganese the author studied its effect in various cultures, using pea and wheat seedlings. It was found that pure solutions of manganese salts are extremely poisonous to pea and wheat seedlings and that the degree of toxicity is greatly reduced by full nutrient solutions and by soil cultures. The injurious action of the manganese ion is manifested mainly toward the tops of plants, chlorosis of the leaves being the first indication of an overdose of manganese. Manganese was found less injurious to plants grown in the dark than to those in the light, and the ions of calcium, potassium, sodium, and magnesium were effective in counteracting the poisonous action of manganese.

In the report upon the toxicity of various cations the author reviews the literature and summarizes his investigations, showing that barium, strontium, ammonium, magnesium, sodium, and potassium, in the order given, when present in pure solution are very toxic to seedlings. This toxicity is greatly reduced by either full nutrient solutions or soil cultures. Under the conditions of the experiments much stronger solutions were required in order to prevent the growth than to kill the roots of seedlings. Seedlings which had been grown for 10 days either in distilled water, tap water, or full nutrient solutions were found more resistant to the toxicants studied than those which were placed immediately in the toxic solutions.

Bibliographies of literature are appended to the different papers.

**Application of fertilizers to plants through their leaves, P. LARUE** (*Rev. Vit., 30 (1913), No. 1028, pp. 261-264*).—Experiments suggested by the report of Hiltner on his work in applying fertilizing solutions to aerial portions of plants (*E. S. R., 27, pp. 324, 651*) were carried out by the author with various plants.

Potatoes were increased in weight by the use of several different applications. Results with mustard and soy beans were variable, some compounds tested appearing toxic. In case of grapevines the conclusion is reached that mixtures calculated against attacks of fungi, etc., may be so proportioned as to give these sprays decided value as aerial fertilizers if the necessary higher degree of adherence can be secured to prevent their removal by rains.

**Saponins as a source of carbohydrates for vegetation.** F. SAUVET (Compt. rend. Soc. Biol. [Paris], 74 (1913), No. 6, pp. 307-309).—The author reports on his experiments with *Aspergillus niger* and *Penicillium glaucum* in nutritive media containing various saponins named, most of which were commercially prepared, stating that all served as nutritive material for these fungi.

**Studies on the distribution of asparagin, glutamin, arginin, and allantoin in plants.** A. SIMON (Hoppe-Seyler's Ztschr. Physiol. Chem., 4 (1913), No. 4, pp. 217-269).—The results are given of investigations carried out regarding the occurrence and proportion of these products in various portions of the plant body, numerous families of plants being represented in the study.

It is stated that asparagin and glutamin were frequently found together in various proportions and sometimes in different families, leading to the conclusion that these products are in some instances used or stored at very unlike rates, the differences in this respect being apparently family characteristics in certain cases. Arginin almost always accompanied asparagin, but less regularly glutamin. Allantoin showed no such close relation to the other compounds in question and no conclusion was reached regarding the part it plays in plant economy.

**The formation of the anthocyan pigments of plants.** VI. F. KLEBER, E. F. ARMSTRONG, and W. N. JONES (Proc. Roy. Soc. [London], Ser. B, 87 (1913), No. B 53, pp. 113-131).—This is in continuation of a series of papers (E. S. R., 29, p. 421), the present one dealing with the pigment-producing glucosid of the wallflower, the formation of pigment-producing substances from glucosids, and the biochemistry of Mendelian color characters.

The pale yellow sap color of the petals of the wallflower is said to be a mixture of hydroxyflavone glucosids. The hydrolyzed product if reduced and subsequently oxidized yields a red pigment. The fact that flowers containing yellow pigments may be caused, by chemical treatment, to yield a red pigment suggests that red mutations should be of possible occurrence within the species. The formation of pigments, as the results of oxidation by oxidase of the hydrolyzed products of glucosids, is determined by the presence of aminocompounds and is of general occurrence.

The authors give a classification of pigments as determined by their investigations. It is suggested as a hypothesis that the higher members of a flower color series owe their origin to the presence with the lower members of specific substances which, acting as receivers of oxygen, reduce the pigments characteristic of the lower members of the color series, accept oxygen therefrom, and thereby become oxidized to pigments of specific color.

**Synthesis by sunlight in relationship to the origin of life.**—Synthesis of formaldehyde from carbon dioxide and water by inorganic colloids acting as transformers of light energy, B. MOORE and T. A. WEBSTER (Proc. Roy. Soc. [London], Ser. B, 87 (1913), No. B 593, pp. 163-176).—The authors found that organic matter (aldehyde) was synthesized from inorganic colloidal uranic and ferric hydroxids in very dilute solution. These colloids are believed to act as catalysts for light energy, converting it into chemical energy in a reduction process similar to the first stage of synthesis of organic from inorganic substances in the green plant by the agency of chlorophyll. Such a synthesis

occurring in nature, they think, would probably constitute the first step in the origin of life.

**Hemicellulose in roots, rhizomes, and tubers, A. STIEGER** (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 4, pp. 270-282).—The author details the results of examinations made on the subterranean parts of 15 plants. He found hemicelluloses in all, but was not able to settle the question as to whether these serve as structural or exclusively as reserve material. A bibliography is given.

**Protoplasmic contractions resembling plasmolysis which are caused by pure distilled water, W. J. V. OSTERHOUT** (*Bot. Gaz.*, 55 (1913), No. 6, pp. 446-451, figs. 6).—This amplifies a preliminary account already noted (*E. S. R.*, 29, p. 134) and gives some details of the study.

It is stated that in many cases contractions in young cells closely simulating true plasmolysis may take place with great rapidity on immersion in pure water, while older cells respond more slowly and show by alterations of their chromatophores that they are undergoing false plasmolysis. True and false plasmolysis may be produced simultaneously, these contractions usually becoming irreversible at a certain point. The effects observed for distilled water were also produced by that from ponds, rivers, and springs, and are therefore held not to be due to toxic products of distillation.

It is held that the cause of these phenomena is increased permeability of the plasma and internal cell membranes, as the result of which some or all of the osmotically active substances diffuse out. The protoplasm then shrinks as the result of the water loss from the vacuoles, this being often followed by apparent coagulation of the protoplasm, with most of the features characteristic of cytolysis in animal cells usually absent. Absorption of water as a cause is precluded by the fact that the cells do not increase in size. The increased permeability is held to be due to the loss of certain substances upon which the maintenance of normal permeability depends (the most important being the inorganic salts), which is followed by increased permeability of the cell membranes as measured by electrical means.

**Toxic inorganic salts and acids as affecting plant growth, C. B. LIPMAN and F. H. WILSON** (*Bot. Gaz.*, 55 (1913), No. 6, pp. 409-420).—Tabulated results are given of preliminary studies made on vetch and wheat as to the effects thereon of varying proportions in the soil of sulphuric acid and of its copper, zinc, and manganese salts, leading to the conclusion that the tolerance of plants for certain of the inorganic salts commonly regarded as very poisonous is much greater than we have been accustomed to believe. Some plants are said to be actually stimulated by quite considerable proportions of such salts. A further search for the limits of toxicity is in progress. The work is claimed to present new evidence regarding the stimulating effects of manganese sulphate on the growth of plants. Certain facts are thought to indicate that the soil flora is permanently modified by the treatment of the soil as herein outlined.

**Arsenic compounds in agriculture and possible danger from their use, G. AMPOLA and G. TOMMASI** (*Ann. R. Staz. Chim. Agr. Sper. Roma*, 2, ser. 4 (1911), pp. 263-277, pls. 2; *abs. in Centbi. Bakt. [etc.]*, 2, Abt., 38 (1913), No. 7-12, pp. 230, 231).—It was found that arsenic acid is injurious to green plants when present in nutritive solutions in concentrations not less than 1 mg. per liter of water. Bean plants died after 24 days in 3 mg. and maize after 27 days in 5 mg. per liter, lupines showing an intermediate degree of resistance, and no plants showing growth at a concentration of 20 mg. per liter.

In soil cultures the limits were more difficult to determine on account of absorption, but growth was usually checked at a concentration corresponding to 0.3 mg. of arsenic per kilogram of soil. The arsenic mostly went to the

leaves, but small proportions were found in the fleshy or juicy portions in the case of gourds, tomatoes, and beans when fresh, only traces being found in dried grains, peas, etc. Absorption of arsenic by soil is said to vary with the concentration and time and to be incomplete.

Arsenic was recovered from the soil under olive trees that had been sprayed therewith for olive fly. It is considered necessary to regulate the use of arsenic in such connection on account of possible injury therefrom.

Studies on the anatomical and physiological influence of tobacco smoke on seedlings, A. PRERKYT (*Anz. K. Akad. Wiss. [Vienna], Math. Naturg. Kl.*, 1912, No. 17, p. 265; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 7-12, p. 211).—The author reports that in tobacco smoke plants develop high turgor which is later gradually lost; that abnormal thickening of the stems is due to growth in the size but not in the number of cells, which in case of the leaf epidermis is expressed in alterations of form, hypertrophy of stomata, and deformation of leaf hairs; and that along with other changes mentioned, the formation of both wood and bast fiber is limited by exposure to tobacco smoke.

Injuries to vegetation by furnace gases and ashes, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen*, 1912, pp. 19-22).—A condensed and apparently preliminary account is given regarding the probable or actual injury done to vegetation in the neighborhood of certain furnaces, factories, etc., distributing smoke gases, ashes, and dust. An illustrative table is given showing that leaves and twigs of hawthorn in an exposed situation gave a considerable increase of the ash, chlorine, and sulphur content.

Effects of illuminating gas on vegetation, G. E. STONE (*Massachusetts Sta. Rpt.*, 1912, pt. 1, pp. 45-60, pls. 2).—The author presents a general description of the effects of gas poisoning on trees and gives a number of specific examples of injurious as well as stimulating effects due to illuminating gas. The symptoms of gas poisoning are said to be best obtained from a careful examination of the wood at the base of the tree or the roots.

During the winter a break in a gas pipe led to the defoliation of a large number of plants in a short time. Those most severely injured were roses, geraniums, and abutilon, though others were also somewhat injured. The ferns, mosses, and liverworts near the gas inlet were scarcely affected. After being defoliated the geraniums and abutilon produced small leaves, and the leaves on the variegated abutilon which were put out were entirely green.

On Carolina poplars illuminating gas is said to show some characteristic effects. The symptoms of gas poisoning are generally a peculiar swelling and cracking of the bark, the lesions often extending for a foot or more along the trunk. On the sides of these cracks the bark was bulged out and examination showed a thick layer of soft parenchymatous tissue extending to the wood and apparently derived from the cambium zone. It is believed that the absorption of the gas may have killed the tissue exterior to the cambium layer before the cambium itself was affected, and that, in this way, the tension of the outer tissues being diminished, a stimulation of the cambium cells resulted.

When willow cuttings were grown in water charged with illuminating gas from time to time, there was found to be a slight acceleration in the development of all plants subjected to gas, although the gain was not very marked. The development of the lenticels and roots seemed to be considerably favored where the cuttings were placed in the gas-charged water.

Influence of a radio-active body on germination, J. CROCHETILLE (*Jour. Agr. Prat.*, n. ser. 26 (1913), No. 37, pp. 332, 333, fig. 1).—The author gives a preliminary report of his experiments regarding the influence of radio-active substance on some common plants, stating that while the results obtained with different plants were not uniform, bean seedlings so treated showed a striking



acceleration of growth, which was more marked in cases where the radioactive powder was applied directly than where plants in tubes were exposed thereto.

**Semipermeability of seed coats, C. A. SHULL** (*Bot. Gaz.*, 56 (1913), No. 2, pp. 169-190, figs. 3).—The author gives an account of investigations carried on for two years regarding the character of the seed coat of *Xanthium*, with particular reference to the work of Beccard (E. S. R., 19, p. 426), Brown (E. S. R., 18, p. 727), and Schroeder (E. S. R., 25, p. 123), with conclusions substantially as follows:

The dry seed coats of *Xanthium* are impermeable to dry alcohol, ether, chloroform, and acetone. Beccard's results with coats of other seeds are confirmed. No evidence of diffusion of oxygen through dry seed coats was obtained. Selective semipermeability independent of living substance was established for the seed coat of *Xanthium* (tests being given of substances admitted or excluded), which, it is said, may be removed and used as an osmotic membrane of superior quality. The outer layer of the testa can not so function, and the inner exceeds the middle layer in this respect, neither of these two being so efficient alone as before their separation. The middle coat contains more tannin than the inner, but the tannin does not exist in either as a continuous layer, and semipermeability is not destroyed by treatment with solvents of tannin. Semipermeability is said to have been demonstrated for the seed coats of plants in six widely separated families, membranes of many plants showing this property even when dead. It is said that the capillary and imbibition force of the embryo of *Xanthium* when the seed is air dry is about 965 atmospheres, and that an increase in the moisture of the embryo equal to 7 per cent of its air dry weight reduces the internal forces by 5200 atmospheres. It is stated that the unusual intake of water noticed with some substances, especially with certain acids and alkalis, is due largely to the development of osmotically active substances inside the semipermeable membrane; also that some evidence was obtained unfavorable to Armstrong's hydrone theory of selective semipermeability (E. S. R., 21, p. 125).

A bibliography is appended.

**The influence of partial suppression of the reserve material in seeds upon the anatomy of plants, M. DELASSUS** (*Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 3, pp. 228-230).—Reporting on an extension of studies already noted (E. S. R., 23, p. 729), the author gives comparative results obtained, concluding that the effects of mutilation of cotyledons upon the anatomical structure of the young plants produced therefrom are marked, showing a retarded and diminished growth expressed by lowered development of the tissues, especially those concerned with support and protection.

**The function of grape leaves in relation to the clusters, A. MARESCALCHI** (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 12, pp. 940-944).—Experimentation is said to have shown that grape clusters on defoliated shoots still form a considerable amount of sugar, also that while quite a proportion of acid is noted there is a deficiency as regards diffusible coloring matters.

**Some points on the floral development of red clover, J. N. MARTIN** (*Proc. Iowa Acad. Sci.*, 19 (1912), p. 129).—This is a brief discussion of the relative rates of development of different parts of the flower of red clover, the resulting inequalities observed, and the changing relations sustained. A more detailed account is to appear later.

**Demonstrations of ectotrophic and endotrophic mycorrhiza, W. B. McDERMOTT** (*Rpt. Mich. Acad. Sci.*, 14 (1912), p. 45).—An abstract is given of a report on an investigation conducted to determine if possible the seasonal, physiological, and ecological relations of mycorrhiza.

on the shellbark hickory three forms of ectotrophic mycorrhiza were found. One of these is bright yellow in color, distinctly filamentous, and has numerous short branches extending into the soil. The second form is brown, the fungus mantle consisting of pseudoparenchyma such as is found in many lichens. The third form is whitish or nearly colorless, distinctly filamentous, but smooth on the outside.

On oaks the same variations in microscopic structure were found, but without the variations in color, all specimens collected being whitish. On larch a form was found in which the outer cells of the root cortex were pushed apart by the growth of mycelia between them. Endotrophic mycorrhiza were found in great abundance on maples, while on American linden the same fungus was found to be both ectotrophic and endotrophic.

Contributions on the colorless sulphur bacteria, G. HAYZOR (*Bot. Bot. Zeit.*, 31 (1913), No. 4, pp. 189-202, pl. 1). The author studied two sulphur bacteria found in slime and mud in the Bay of Naples, one being already known as *Thiosphaera mulleri*, the other being considered as new and named *Thiosphaera* n. sp.

Culture of micro-organisms, E. KÜSTER (*Kultur der Mikroorganismen*, Leipzig and Berlin, 1913, 2. ed., rev. and enl., pp. 218, figs. 266). This is the second edition of a book previously noted (13, S. R., 10, p. 355).

## FIELD CROPS.

Causes of the increased yields of agricultural crops during the last three decades, D. LERN (*Illus. Landw. Ztg.*, 32 (1913), Nos. 69, pp. 637, 638; 70, pp. 35-38).—The author discusses the increased yields during the last three decades and attributes them to the increased intelligent use of commercial fertilizers, the introduction of better producing varieties, management systems, and methods of soil cultivation.

Making money on farm crops, F. B. SUMMERS (*Sci. Soc. Ph. Mo.*, 1913, pp. 88, figs. 86).—This book discusses soils for crops and the improvement of farm crops, with chapters on the production of alfalfa, clover, cowpeas, corn, wheat, oats, and the sorghums.

[Experiments with field crops] (*Abstr. in Jour. Bot. Soc. (London)*, 19 (1913), Vol. 11, pp. 936-939; 12, pp. 1629-1631; 29 (1913), No. 1, pp. 1-5). Several abstracts are given of reports of locally conducted experiments in Great Britain with grasses, mangolds, wheat, barley, sugar beets, permanent pastures, potatoes, oats, peas, tobacco, millet, and Chinese alfalfa.

Field experiments (Yorkshire Council Exp. Lab. and Univ. Leeds [Pamphlet] 5, 1912, pp. 2-36).—In fertilizer experiments with meadow hay, the unmanured plots consisted chiefly of bent and sorrel. Barnyard manure applied each year seemed to encourage the growth of the better grasses, especially foxtail and cocksfoot, and to repress bent. Applied in alternate years it apparently increased the growth of the desirable grasses, particularly golden oat grass. Using barnyard manure and complete artificials in alternate years encouraged foxtail and cocksfoot, golden oat grass, and tall oat grass, but the highest percentage of good grasses followed a complete mixture of artificials applied every year. With niter and superphosphate applied annually desirable grasses and also sorrel to a slight extent were fostered, while with nitrate of soda alone cocksfoot and tall oat grass thrived at the expense of bent, and with sulphate of ammonia alone cocksfoot thrived at the expense of foxtail and golden oat grass. Lime did not seem to increase the yield of hay but to suppress the growth of sorrel.

Plans of manurial experiments with pasture grasses, potatoes, and swedes are given.

[Field crop experiments], P. H. FOULKES (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 3-14, 21, pl. 1*).—In these experiments lime seemed to be of benefit to grass lands. Two and one-half cwt. of superphosphate and  $\frac{1}{4}$  cwt. of sulphate of potash apparently gave better results than other fertilizers used, the yield being 39 cwt. 32 lbs. of hay per acre.

Variety tests with wheat, oats, swedes, mangels, and sugar beets are given in tabular form. The results of fertilizing with a radio-active substance containing silicon 80.44, water and volatile organic matter 10.54, oxid of iron and alumina 2.24, total sulphuric acid 5.40, soluble phosphoric acid 1.37, and soluble salts and soluble free acids 3.32 per cent, with a trace of uranium, and applied with a commercial fertilizer at the rate of 2 per cent of the total application, were contradictory with swedes, but increased yields of from 2 to 4 tons per acre followed its use with mangels.

Forage crop trials are reported with alfalfa, sainfoin, woad grass, crimson clover, *Lathyrus sylvestris*, flax, and Helianta. A Chinese alfalfa produced at the rate of 4 tons 1 cwt. per acre. Woad grass, cut June 13, yielded 10 tons 8 cwt. per acre, and flax yielded 520 lbs. seed and 26 cwt. fiber per acre.

Manurial experiments, G. BALFOUR and J. C. RUSHTON (*Field Expts. Harper-Adams Agr. Col., and Staffordshire and Shropshire, Rpt. 1912, pp. 46-58*).—Tabulated results are given of manurial experiments carried on at 11 centers with meadow hay, mangels, swedes, potatoes, sugar beets, and alfalfa. Basic slag, 500 lbs. per acre, in place of superphosphate (300 lbs.) seemed to check greatly the "potato disease." At one center 300 lbs. of barnyard manure per acre apparently produced increased yields with mangels.

Report of Hedemarken Experiment Station, 1912, W. CHRISTIE (*Ber. Hedemarkens Amts Forsöksstat. Vbks., 8 (1912), pp. 59, pls. 3*).—Accounts of the following lines of investigation are given: Trials with seed potatoes of different sizes, with different distances of planting, and with whole and cut seed potatoes, 1908-1912; the starch content of samples of potatoes, 1912; trials with alfalfa, 1906-1911; farm manure and artificial fertilizers for turnips, 1907-1911; and top-dressing with artificial fertilizers for meadows, 1910-1912.

Report of Ribe County Western Agricultural Society, 1912, N. ESKRUD (*Ber. Ribe Amts Landbofor. Harebr. og Husmands., 1913, pp. 34*).—The experiments with shelter for agricultural crops, which were commenced in 1906 (*E. S. R., 28, p. 40*), were continued during 1912. The results obtained corroborated those previously reported, showing that shelter had a very beneficial influence on the growth of farm crops and increased the yields obtained in a marked degree. The planting and care of windbreaks and hedges which break the force of the wind therefore doubtless constitute a phase of profitable permanent farm improvements.

Report of the plant culture stations, 1912-13, H. C. LARSEN ET AL. (*Ber. Stat. Planteavl. [Denmark], 1912-13, pp. 150*).—A brief account of the organization and activities of the different Danish plant culture stations during the year.

Plant breeding at Tystofte, E. LUNDHARD (*Tidsskr. Landbr. Planteavl, 20 (1913), No. 1, pp. 1-23, figs. 5*).—The paper gives the general principles followed in the plant breeding work done at this experiment station.

A method for variety tests, O. BRAGER (*Illus. Landbr. Ztg., 32 (1912), No. 31, pp. 827-829, figs. 3*).—This article discusses conditions arising from irregularities in soils and the need of multiplication of plots to reduce experimental error and secure comparative yields. A method of using 100 plots, 24 meters

square, in which 20 varieties were so arranged as to repeat each 5 times, is explained and illustrated. The use of the formula  $\Sigma \pm d \cdot 0.845$   $\sqrt{n(n-1) \cdot \overline{d^2}}$  is explained in calculating the probable experimental error for these 20 plots. In this formula  $\Sigma$  = the sum of the yield of the repeated plots;  $d$  = the difference in yield from the mean;  $n$  = the number of plots, and 0.845 is a constant. By the use of this formula the author states that the probable error for each plot may be determined and so increase the accuracy and usefulness of the result of a test.

The influence of different vegetative factors on yield and counteracting relations of artificial factors added to the soil, E. A. MÜSCHLER and L. FLOESS (*Landw. Jahrb.*, 43 (1913), No. 4, pp. 649-668, figs. 51).—In this article the authors discuss the law of minimum yield, the vegetative factors of light, soil temperature, and water, and the opposing influences of artificial vegetative factors in the way of fertilizers. It was noted that responsive energy was at its optimum in sunlight; that active energy in the roots was the result of soil temperature and favored increased yields; that loss of energy through increased root labor was a factor in decreasing yields; that the plant yield correlated with soil water subject to the law of minimum; and that yields were limited by the small quantity of soil water, but favored when this water was in the upper soil layer and when the plant food was such as to be soluble in the water during the entire vegetative period, so that the roots were relieved of heavy work.

Cereal investigations at the Nephi [Utah] substation, P. V. CAMDEN (*U. S. Dept. Agr. Bul.*, 39, pp. 59, figs. 9).—This bulletin contains a report of the work of the substation, previously mentioned (*E. S. R.*, 23, p. 634), and includes a description of the substation and of the soil and climatic conditions that surround it. Tables give some meteorological data for the years 1908 to 1912, inclusive. The experimental work reported consists mainly of varietal and improvement tests of 68 varieties and strains of winter wheat, 1 of winter oats, 3 of winter barley, 2 of winter rye, 10 of spring wheat, 7 of spring oats, and 14 of spring barley. Tables present data concerning yields, stand, dates of ripening, height, ratio of weight of grain to straw, and average weight per bushel of wheats and barleys, and the results of testing large, medium, small, and unseparated seeds of wheat planted at different distances in the row.

The results obtained show that "the winter varieties of all cereals have given better results than have the spring varieties. Of the winter wheat varieties, the hard red group has given the best yields. The soft white group, commonly grown in the Intermountain States, is comparatively low in yield. There seems to have been no definite correlation between stand and yield. The average date of heading and also the average date of ripening were about the same for all varieties. The average height of the winter wheats at Nephi during 1908 to 1912, inclusive, was 27 in. Approximately 1 lb. of grain was produced with every pound of straw.

"The average bushel weight for all varieties of winter wheat for the 5-year period was 61.4 lbs., or 1.4 lbs. above the standard weight. The average acre yield of spring wheats since 1908 is only 7.5 bu. for durum varieties and 8.9 bu. for common varieties, which is unprofitable in comparison with the acre yield of 17 to 23 bu. from winter wheats. Boswell winter oats have yielded very well in some seasons. In other seasons the yield has been low, thus reducing the average acre yield to 17.2 bu. for 1909 to 1912. However, the variety gives great promise as a winter oat for the Intermountain region. The Black American, Giant Yellow, and Swedish Select varieties of spring oats have acre yields

of 15.2, 14.2, and 13.6 bu., respectively, in 1900 to 1912, inclusive. Two winter varieties of barley have given promising results. Of these 2, Utah Winter (C. I. No. 592) has yielded an average of 19.6 bu. per acre, as against 15.8 bu. for Tennessee Winter (C. I. No. 257). Three spring varieties were planted, but all failed and were discarded in 1910. Black Winter emmer has shown itself adapted to conditions at Nephel, and probably will prove a valuable crop on the dry farms of the Mountain States. There was no apparent difference during 1912 between Buffum Improved Black Winter emmer (C. I. No. 3331) and the ordinary Black Winter emmer (C. I. No. 2337). . . .

"The following data obtained from the head rows are directly related to the results of the plot experiments: (1) The average winter survival of the crops was about 65 per cent; (2) the tillering of the winter cereals varied with the thickness of the stand; (3) the average number of culms per plant in winter cereals seldom exceeded 25, though favored plants would sometimes have a greater number; (4) the average yields of the head rows gave the winter varieties about the same rank as did the plot experiments; (5) the spring cereals yielded less than the winter varieties, even though a better stand was obtained. . . .

"Some work has been done with grain sorghums, broom corn, millets, and prosoas, but the results obtained have given little promise that these crops are adapted to the dry lands of the intermountain region.

"In the test of size of seed with both spring and winter varieties of wheat the large seed was best in number of heads produced per plant and in yield per row. No great difference was observed among the different sizes of seed in the percentage of survival, plants maturing, or length of heads produced. In the test of different seed treatments for smut, the following points were observed: (1) The effect of the time of seedling on smut depended largely on the season; (2) the best copper-sulphate treatment was 4 lb. of copper sulphate to 10 gal. of water, the seed soaked 10 minutes and dried; (3) the best formalin treatment was 2.5 parts of formalin to 1,000 parts of water, the seed soaked 10 minutes and kept moist 2 hours."

**Prevention of lodging of cereals.** ZIEGLER (*Illus. Landw. Ztg.*, 32 [1912], 1: 83, pp. 761, 762, figs. 3).—In a comparison with nitrogen and phosphorus, potash gave the best results in preventing lodging, due, it is believed, to the greater constitutional vigor of plants fertilized with this element.

**The influence of moisture, fertilizer, and firmness of the soil on the root development of barley and wheat in early stages of growth.** R. PAUL (*Über den Einfluss verschieden hohen Wassergehalts, verschiedener Düngung und Festigkeit des Bodens auf die Wurzelentwicklung des Weizens und der Gerste im ersten Vegetationsstadium. Abzug. Diss., Univ. Göttingen, 1919, pp. 84, pls. 21*).—The experiments here discussed were carried out in 2 sizes of pots of the Bücherhüllen form. Sixty-four pots had a height of 20 cm. and a width of 6 by 30 cm., and 32 were 30 cm. high and 6 by 20 cm. wide. Half of them were filled with clay soil and half with sandy soil. The low vessels each had 2 plants and the higher ones 1 plant each. To obtain more accurate results each treatment was repeated in 5 pots. Part of the pots were fertilized with 1.5 gm. nitrogen as nitrate of soda, 1/5 gm.  $P_2O_5$  in  $CaH_2(PO_3)_2$ , and 1.5 gm.  $K_2O$  in 40 per cent potassium salt, and the sandy soil received 0.5 gm. calcium carbonate in addition. In a part of the pots the soil was carefully and uniformly packed in the case of both sandy and clay soils, and in the remainder the 2 kinds of soils were left in a loose condition. The barley was planted on June 11 and harvested from June 21 to 26. The wheat was planted on July 14 and harvested from July 22 to 28. A unique method is described of securing the roots in a normal position by means of pressing a board, provided with num-

long needles set at right angles to its surface, into the soil of the pot containing the roots after one side of the pot had been removed.

This study was planned to throw light on the influence of fertilizer, moisture, and firmness of soil on the amount of root growth, the length of roots, and the weight of above-ground parts, and the ratio between the root mass and the above-ground parts, in respect to clay and sandy soils with barley and wheat.

A clay soil, fertilized, showed a less length of root system in a dry condition (12.5 per cent moisture content) than in a moist condition (40 per cent moisture content), but a greater weight of root growth, whether loose or hard packed, fertilized or not, with both barley and wheat. Root growth was generally greater in the loose clay with barley, but compaction was more favorable with wheat. With wheat, the unfertilized clay soil produced greater root growth than the fertilized without regard to the moisture or compaction of soil.

With a sandy soil the root development was generally greater without the fertilizers, regardless of the degree of moisture or firmness of soil, with both barley and wheat, while in the presence of other factors firmness favored root development. In general, a greater root system was produced in the case of barley in a dry (5.4 per cent moisture content) sandy soil, whether loose or firm, fertilized or not. A dry sandy soil produced a better root system with wheat in a loose condition than when compact, without regard to the fertilizer application.

In general, with both barley and wheat 1 gm. of roots produced a larger amount of above-ground parts in both clay and sandy soil when fertilized than when not fertilized, in a moist soil than in a dry soil, and in a compact than in a loose soil.

**A study of the variations in chemical composition of the timothy and wheat plants during growth and ripening.** L. D. HATCH (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 26 (1912), Sects. Ia-XIb, App., pp. 115-117).—This is an abstract giving the results found with timothy at 7 stages of growth and with wheat at 4 stages.

"The timothy plant takes up its plant food, nitrogen, and ash constituents at the most rapid rate in the young stages. It continues at a decreasing rate to absorb plant food during growth and in about the same rate as this growth ceases. The percentage of moisture in the green plant is also the highest in the young stages. The heads of timothy increase in dry matter throughout the growth and ripening period. This increase includes all the plant constituents except potassium oxid, which had reached its maximum amount before the heads were collected for analysis. . . . Nitrogen-free extract increases at the greatest rate of all constituents. As the heads approach full ripening a noticeable increase of phosphorus pentoxid occurs. The stalks of the timothy increase in dry matter during growth and ripening; this dry matter added consists chiefly of crude fiber and nitrogen-free extract. Nitrogen, other soluble material, potassium oxid, and phosphorus pentoxid increase during growth but decrease to some extent during ripening. The bolls increase in dry matter throughout the growth period, but the amount becomes constant before ripening of the hay. The material stored up is principally nitrogenous matter and nitrogen-free extract. No starch is produced in the bolls during the storing process. Potassium oxid is found in maximum amount in the first stage but phosphorus pentoxid tends to increase in amount as the plant matures.

"Large amounts of available potash and phosphoric acid are required for a good yield of timothy. Timothy would hardly prove a profit-yielding crop on soils other than those rich in potash, especially where the mineral elements would have to be supplied in the form of fertilizer.

"The wheat plant also takes up its principal plant food, nitrogenous and mineral matter, at the greatest rate in the young stages and at a decreasing rate as growth proceeds. The highest percentage of moisture in the green plant is found in the first series. The heads of the wheat gain more uniformly and rapidly in their amount of dry matter than any other part. Nitrogen-free extract is produced and stored at a greater rate than any other constituent, but nitrogen, ash, and other soluble matter are added in some quantity also. Fiber is practically all formed by the time the blossom has fallen and remains constant to ripening.

"The wheat stalks contain their maximum amount of dry matter at blossoming time, after which they pass some of this material along to the ripening heads. Nitrogenous substance and nitrogen-free extract appear to be the constituents which the stalks yield up to the heads. The wheat roots and stubble increase in dry matter up to the milk stage, after which it decreases in amount, being passed along to the plant above ground. Fiber present in the roots does not decrease in amount but nitrogenous and other soluble material, ash, and nitrogen-free extract pass out of the roots into the growing plant above ground during the ripening of the heads."

[Fibers from Papua (British New Guinea) and India] (*Bul. Imp. Inst. [Sci. Kensington], 10 (1912), No. 2, pp. 214-219*).—This report includes analyses and valuations of cotton, sisal hemp, Sida fiber, *Sida rhombifolia*, and Indian jute.

The use of sulphur in the cultivation of turnips and beets, A. MAGNIER (*Jour. Soc. Nat. Hort. France, 4. ser., 14 (1913), Jan., pp. 54-58*).—Experiments are here cited, in which sulphur scattered in the row at the rate of 2 to 3 gm. per meter at planting time apparently doubled the yields.

Bean growing in eastern Washington and Oregon, and northern Idaho, L. W. FLEMING (*U. S. Dept. Agr. Farmers' Bul. 561, pp. 12, figs. 5*).—This describes cultural methods, with suggestions on marketing, uses, and improvement of the crop.

Field trials on the manuring of carrots, E. E. STOKES (*Midland Agr. and Hairy Col. Bul. 5, 1912-13, pp. 33-35*).—It is concluded that "farmyard manure may probably be supplemented with chemical fertilizers; salt applied to the description of soils generally used for the production of carrots is beneficial, especially in a dry, hot season; potash in some form is absolutely necessary, especially when dung is not so largely used; phosphates come next in order of importance; and the addition of nitrogenous manures may be advisable to promote a good start and early growth."

Clovers, M. CALVINO (*Estad. Agr. Cent. [Mexico] Bol. 69, 1912, pp. 92, pls. 44*).—This bulletin treats of the climate, soil, rotations, inoculation, fertilizers, cultivation, harvests, and methods of conserving the crop and silage in relation to the clovers *Trifolium pratense*, *T. repens*, *T. alexandrinum*, *T. soaveolens*, *T. incarnatum*, and *T. hybridum*. Various methods of rotation in which clovers are used as green manures are described.

Crimson clover, A. E. GRANTHAM (*New Jersey Stat. Circ. 28, pp. 4*).—This gives suggestions and directions for growing the crop under New Jersey conditions.

Effect of frost on corn, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 67, 68*).—Chemical analysis of frosted corn revealed little new, excepting that the fiber percentage seemed to be larger than is usually the case. "In case the corn is intended for the silo, the quicker the crop is ensiled the better. If the crop is not to be ensiled, it may be allowed to stand uncut for a week or two."

Seed selection of Egyptian cotton, T. H. KEARNEY (*U. S. Dept. Agr. Bul. 33, pp. 8*).—In this bulletin the author discusses the importance of keeping the

stock pure and describes methods that may be employed by breeders whereby the purity of the seed may be maintained. It is believed that but one variety of cotton should be grown in a locality, that careful roguing should be practiced, and that growers' associations should arrange for pure seed production.

Nine titles of Bureau of Plant Industry publications on this subject are appended.

**Propagating cotton plants by slips.** G. GASTET (*Rev. Hort. Algérie*, 6 (1912), s. 5, pp. 144-148, figs. 4; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. et. and Plant Diseases*, 3 (1912), No. 10, pp. 2164, 2165).—A method by which fibrous slips are pricked out in the hotbed or greenhouse is described in this article. The plants from which the slips are taken are removed from the field in the greenhouse late in the season, and profuse budding is induced.

**Cowpeas for soil improvement.** A. E. GRANTHAM (*New Jersey Stax. Circ.* 27, p. 4).—This gives directions and suggestions for growing the crop under New Jersey conditions.

**On the value of meadow foxtail grown on peat soils and the influence of time of cutting.** H. VON FEILITZEN, I. LUGNER and E. NYSTRÖM (*Svenska Jordkulturför. Tidskr.*, 27 (1913), No. 3, pp. 224-245).—Previously noted from another source (*E. S. R.*, 28, p. 634).

**A variety test of potatoes.** E. F. GASKILL (*Massachusetts Sta. Rpt.* 1912, s. 2, pp. 11-16).—This paper contains brief notes on tests including 371 varieties during the past 18 years. The rate of yields ranged from 65 to 500 bu. per acre. It is noted that the majority of the new varieties are inferior to the standard sorts, like Beauty of Hebron, Green Mountain, Early Rose, and Ash Cobler, and that northern-grown seed was preferable to home-grown seed. [Field crop experiments], G. T. MALTHOUSE (*Field Expts. Harper-Adams gr. Col. and Staffordshire and Shropshire, Rpt.* 1912, pp. 17-19).—Results of variety tests of potatoes show yields as high as 6 tons 13½ cwt. per acre.

**On the use of sulphur for the prevention of potato scab and as an indirect fertilizer.** H. VON FEILITZEN (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), s. 2, pp. 120-130).—Of the 5 varieties of potatoes experimented with during 1911, all but 1 yielded more on the plots receiving 400 kg. of sulphur per hectare (356 lbs. per acre) in addition to normal fertilizers than on those that did not receive sulphur, and the tubers were larger and better developed. Some improvements in regard to the appearance of scab were noted on these plots.

Trials with sulphur for horse beans and ray grass during 1912 are also reported. A bibliography on the subject of sulphur for plants is appended.

**Lessons for American potato growers from German experiences.** W. A. KRON (*U. S. Dept. Agr. Bul.* 47, pp. 12).—The author discusses potato production as carried on in Germany, with special reference to conditions in this country.

It is noted that in Germany "the acreage is more than double that of the United States and the crop harvested more than 4 times our total. Of these potatoes 40 per cent are fed to stock, 28 per cent are used for table purposes, 1 per cent for seed, 6 per cent for alcohol, 4 per cent for starch and related products, and 10 per cent decay. The per capita consumption for food is 7.3 bu. per year in Germany, as compared with an estimate of 2.6 bu. in the United States. . . .

"We must hereafter produce enough potatoes to supply all our needs, as sources of foreign imports have been closed by a plant-disease quarantine. . . . do this economically we should find a profitable outlet for a surplus production. . . . The most promising use for culls and surplus potatoes appears to be



in feeding hogs. There are possibilities in starch and alcohol and some hope of adapting the method of drying now used in Germany."

Beet sugar in New England, J. B. LINDSEY (*Massachusetts Sta. Rpt.*, 1914, pt. 2, pp. 69, 70).—The author briefly reviews attempts to introduce sugar-beet culture in Massachusetts, and concludes "that while the climate is satisfactory and a considerable area is suited to the beet, economic conditions are not favorable to the production of beet sugar in Massachusetts."

Sugar-cane experiments, J. B. HARRISON and R. WARD (*Jour. Bd. Agr. Br. Guiana*, 6 (1913), No. 3, pp. 123-126).—In a test with molasses as a fertilizer for sugar cane, only a slight increase could be detected from applications of 100, 200, and 300 gal. per acre. Partially sterilizing the soil of experimental plots with chlorinated lime applied at the rate of 150 lbs. per acre apparently gave slightly increased yields of cane over untreated plots.

Classification of the forms of *Helianthus annuus*, T. SZATYEBOW (*Trudy Buro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 2, pp. 95-110, figs. 3).—Four forms are mentioned, viz. common, white, black, and armored sunflower. The last-named has a subepidermal layer of parenchyma cells which seem to be especially useful as a protection against the attacks of disease.

Research work at Harrow Experimental Station, 1911, W. A. BAKER (*Canada Dept. Agr., Tobacco Div. Bul.*, A14, 1912, pp. 20, pls. 2).—This bulletin reports experiments in which different kinds of seed beds were established for tobacco.

The conditions point to the advisability of making up the bed 10 days before sowing, which was done at the rate of 1 teaspoonful (1/7 oz.) of seed to 70 sq. ft. To hasten the growth of seedlings a stock solution of 1/4 lb. of nitrate of soda to 2 gal. of water was made, one pint of which was diluted with 10 gal. of water for application.

Tests in curing in small and large kilns and fertilizer tests with bright tobacco were carried out. In a comparison between the bright tobacco and Burley, the Burley proved the more profitable. A description of a new curing barn is given.

Tobacco culture, G. N. BLACKSHAW (*Rhodesia Agr. Jour.*, 10 (1912), No. 1, pp. 56-66, pls. 5).—In this article methods of preparing the soil are given, these including the burning of the soil to a depth of 1/2 in. As a remedy for cutworms a poison is suggested which consists of 1 lb. arsenite of soda, 5 lbs. brown sugar, and 10 gal. of water; this is to be mixed with green stuff or corn meal and distributed over the ground a few days before the tobacco is transplanted. Broadcasting or drilling the fertilizer in the soil before the plants are set is advised, as compared with top-dressing later.

Suggestions for gathering and storing the seed and directions for growing, curing, storing, and baling Turkish tobacco are given.

Cultivation of tobacco for the preparation of fruit and hop washes (*Jour. Bd. Agr. [London]*, 19 (1913), No. 12, pp. 985-994).—This article discusses the difference between smoking tobacco and that used for the extraction of nicotine. It is stated that the latter should be of rank, coarse-growing varieties unfit for smoking purposes. Methods of cultivating, fertilizing, harvesting, extracting and preparing the washes are discussed. The cost and returns per acre are given. In Kent in 1911 yields of over 2,000 lbs. of dry leaves, with over 150 lbs. of nicotine, per acre were obtained.

A cross between *Triticum vulgare* and *T. monococcum*, N. WATSON (*Trudy Buro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 1, pp. 1-19, pl. 1, fig. 1).—The chief characteristics of this cross were observed to have been lateness in ripening and sterility.

**Wheat growing in Wisconsin**, E. J. DELWICHE and B. D. LEITH (*Wisconsin Sta. Bul.* 233, pp. 5-22, figs. 8).—This bulletin outlines briefly the present status of wheat growing in Wisconsin, and includes reports on results of experiments which for six successive seasons have been carried on at the station at Madison and at the substations in the different sections of the State. In this connection are discussed the cause of the decline in wheat growing in Wisconsin, the present outlook, and wheat and soil depletion. Under essentials of wheat culture are discussed rotations, soil preparation, good seed, time and manner of seeding, harvesting and threshing, and spring and winter wheat.

Tabulated data of variety tests of both winter and spring wheats are given, including nearly 30 selections. In general, winter wheat outyielded spring wheat.

**Some variable results of seed testing**, G. E. STONE (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 22-30).—This paper gives results of purity and germination tests made at about 20 different seed-testing stations of seed taken from the same bulk, and discusses the difficulties underlying the identification of seeds. The seeds used were red clover, timothy, Kentucky blue grass, orchard grass, millet, and alfalfa. Wide variations were obtained from the various stations. The germination of Kentucky blue grass was reported at from 3 to 88 per cent, and orchard grass showed a range of 45 per cent.

**Seed work for the year 1912**, G. E. STONE (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 17-21).—This gives results with 285 samples for germination and 2 samples for purity tests. A total of 1,517 lbs. seed was separated. The seeds used for purity were of unusually high grade.

**"Yellow rattle," as a weed on arable land**, WINIFRED M. BREXCHLEY (*Jour. M. Agr. [London]*, 19 (1913), No. 12, pp. 1065-1069, figs. 2).—Two distinct species of this parasite are noted, *Rhinanthus minor* and *R. major*. Their life history, means of attaching to cultivated crops, especially grasses and cereals, and the method of combating, which consists chiefly of fallow cultivation for a season, are discussed.

## HORTICULTURE.

**Intensive farming**, L. C. CORLETT (*New York*, 1913, pp. 146+11, pls. 8, figs. 3).—This comprises a popular handbook of information on the fundamental practices employed in various types of intensive farming. The subject matter is discussed under the following general headings: The problem, vegetable growing, onions, celery, frame culture, the vegetable forcing industry, fruit growing, small fruits, the citrus industry, plant breeding as a factor in intensive farming, seed growing, the nursery an example of intensive crop production, irrigation, animal industry, economics of intensive industries, and the cropping system as a unit.

**Recent progress in Belgian horticulture**, VERHEUWE (*Internat. Inst. Agr. Rome*), *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 9, pp. 1321-1331.—In this paper the author briefly reviews the recent developments in Belgian horticulture, including the measures employed to maintain and safeguard the interests of the horticultural industry.

**Malnutrition or overfertilization of greenhouse crops**, H. D. HASKINS (*Massachusetts Sta. Rpt.* 1912, pt. 2, pp. 71-79).—An analytic study of greenhouse soils in which cucumbers and sweet peas made sickly growth leads the author to conclude that imperfect growth and development were due in these cases, as well as in many other cases where plant growth is unsatisfactory, to an annual accumulation of soluble plant food rather than to fungi and bacteria. With cucumbers the trouble does not usually develop until the third year

after the soil has been placed in the houses. The plants which at first are usually very vigorous turn yellow prematurely and fail to develop fruit.

The author emphasizes the importance of good drainage in greenhouse beds and benches. Wherever indications of overfertilization appear the soil should be leached out with hot water as soon as the crop is removed. The crop may sometimes be saved by applying about 3 in. of fresh loam to the surface of the bed and working lightly around the plants. This promotes the formation of new roots. After the removal of the crop from one-third to one-half of the soil in the benches should be replaced with new loam before replanting.

The influence of various light intensities and soil moisture on the growth of cucumbers, and their susceptibility to burning from hydrocyanic acid gas, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 61-72, pl. 1*).—The experiments here reported were conducted at the station by F. L. Thomas with cucumber plants which were grown in the greenhouse under varying light and soil moisture conditions alongside plants growing under normal conditions. After the plants had reached a certain degree of development they were all submitted to the same normal hydrocyanic acid gas fumigation.

Summarizing the data relative to light conditions, the greatest average height of the plants and length of internodes were found in the series where the light was less, while, on the other hand, the shortest internodes and greatest diameter of the stems occurred in those plants which received the most light. The average length and width of leaf was variable but the plants grown where the light was excluded had the largest leaves. It is suggested that the production of larger leaves under certain light intensities is apparently a response to a demand for greater carbon assimilation. In the soil moisture experiments the average height of the plants was greater and the leaves larger in the pots containing the largest percentage of water. Within certain limits the diameter of the stems and length of the leaf petioles and internodes was also greater in the plants growing in a higher percentage of soil moisture; in pots containing as high as 70 per cent of water there was too much water for the best development.

Burning from hydrocyanic acid gas was more extensive on plants grown under a poor light and excessive moisture conditions than where the light and moisture conditions were good, showing that burning by fumigation is induced by a difference in the development of the tissues whether brought about by inferior light conditions or excessive moisture. Further experiments are being conducted to throw more light on the influence of other factors on burning.

Some effects of fertilizers on the growth and composition of asparagus roots, F. W. MORSE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 154-167*).—The experiments here reported have been noted from another source (*E. S. R.* 2, p. 236).

The inheritance of blossom color in beans, J. K. SHAW (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 182-203, pl. 1*).—The author here presents and discusses a series of tables which show the inheritance of blossom color in various combinations of some 19 varieties of garden beans, the progeny from the crosses having been self-fertilized through four generations. An interpretation of the results relative to blossom color is to be made later through an analysis of the records of the inheritance of seed-coat color.

Report of cranberry substation for 1912, H. J. FRANKLIN (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 209-234*).—A progress report on the experiments conducted and observations made at the cranberry substation during the year (*E. S. R.*, 28, p. 341). The subject matter is discussed under the following general headings: Weather observations, frost protection, fungus diseases, varieties, blossom pollination, fertilizers, insects (see p. 154), and miscellaneous.

Progress in determining the local conditions which indicate frost is reported, the season's records indicating that the early evening dew point can be relied upon to a considerable extent in forecasting minimum temperatures on the bogs. The use of oil heaters was found to be effective as protection against frost, but was too expensive to be practicable.

In the work with fungus diseases being conducted in cooperation with the U. S. Department of Agriculture five plats each 4 rods square received two sprayings of Bordeaux mixture and one of neutral copper acetate. Two lbs. of reola fish-oil soap were used with the Bordeaux in all cases and with the acetate. As compared with the check plats increased yields of from 45 to 144 per cent were secured on the sprayed plats. During the previous year the sprayed plats showed no increase in quantity of fruit over their checks, hence it is suggested that the effects of annual spraying may be cumulative. When the fruit was gathered no distinct difference in color between the berries from the sprayed plats and their checks was observed, but differences in the size of the berries appeared to be influenced by the time of picking. In early picked fruit the berries on the check plats were larger, whereas in the last pickings the berries on the sprayed plats were larger. It is suggested that this was due to a retardation in the development of the fruit on the sprayed vines due to the heavier crop which they were producing. The keeping quality was improved by spraying, although this was more marked with the Howe variety. This and the distinctly greater increase in quantity of fruit on the Howe plats indicate the presence of a special diseased condition affecting that variety more seriously than the others. This disease, hitherto undetermined, has been tentatively called "blossom end rot." Its characteristic effect on the fruit is to cause it to rot, beginning at the blossom end and working gradually toward the stem end, the berry becoming soft, but remaining plump and watery, as the decay progresses. The tests appeared to give no evidence that the stage of ripeness at which the berries were picked had any effect on their keeping quality. Observations made during the past two years seem to indicate that resanding favors fungus diseases and that spring sanding favors fungus development more than does fall sanding.

The pollination experiments as continued on another part of the bog (E. S. R., 28, p. 841) appeared to contradict partially the results previously secured, inasmuch as the area over which the bees were excluded bore at least half a crop of berries. The experiment is to be repeated.

Observations made during the year indicate that the berries of a heavy cranberry crop will, other conditions being equal, keep better than those of a light crop, and that the surface roughening of the fruit in certain varieties may be relied upon to some extent as an indicator of their keeping quality.

The results of storage tests which were carried out with berries from all the fertilizer plats gave no evidence that any of the fertilizers, except perhaps the acid phosphate, had affected the keeping quality. Nitrate of soda had a marked effect in increasing the quantity of fruit, although the variation in size between the berries from the different plats was not very great. Potash caused no increase in fruit and the phosphate but very little. If lime had any effect, it was detrimental. The vines on the plats to which nitrate was applied made a more luxuriant but desirable growth than those on the rest of the bog.

*New varieties of fruits, A. NOMBLOT (IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps., 1911, pp. 464-468).—*With the view of procuring new varieties of tree fruits sowings of seed from different varieties were made a number of years ago. Consideration is here given to those forms which have arisen from naturally fertilized fruits.

The results with the cherry have shown that certain types, as the Bluebreach, Morello, Black Heart, etc., possess some degree of fixity. The Miracle and Green Gage plums and a number of peaches have also proved to be relatively fixed. In the case of apples and pears many forms varying in their vegetative characters and not resembling the maternal parent have been obtained.

The author is not inclined to favor grafting as a means of hastening the fruiting period of seedling trees since this method has not given conclusive results. Moreover, he does not favor the propagation of varieties by the use of immature wood.

Crew work, costs, and returns in commercial orcharding in West Virginia, J. H. ARNOLD (*U. S. Dept. Agr. Bul.* 29, pp. 24, figs. 5).—In this bulletin the author summarizes and analyzes the experiences in orchard management of different individuals who have been pioneers in the development of the peach industry in the drainage basin of the Potomac River in West Virginia. Practically every factor involved in peach growing is considered with special reference to the determination of costs.

From an analysis of the data secured the author comes to the general conclusion that with the most favorable conditions that can be reasonably expected and under the most skillful and experienced management, average dividends of over 25 per cent are practically impossible. At the average price of 65 cts. per basket a good manager might reasonably expect to pay 10 per cent dividends on the money invested.

Cultivation and exploitation of the avocado, G. R. VALENCIA (*Estac. Agr. Cent. [Mexico] Bol.* 71, 1912, pp. 70, pls. 20).—A popular treatise on the botany, culture, exploitation, and uses of the avocado.

Mulberry and fig culture, M. CALVINO (*Estac. Agr. Cent. [Mexico] Bol.* 73, 1912, pp. 34, pls. 8).—A popular cultural treatise with special reference to Mexican conditions.

On some hybrids of *Vitis vinifera* and *V. berlandieri*, GARD (*IV. Conf. Internat. Génétique Paris, Compt. Rend. et Raps.*, 1911, pp. 395, 396).—In studying a number of hybrid forms of *V. berlandieri* × *V. vinifera* raised from seed of *V. berlandieri* it was observed with regard to the stem that the hairy character of the maternal parent and also the glabrous character of most varieties of *V. vinifera* occurred among the hybrids, together with a large number of intermediate forms. Transverse sections of the stem show that the structure is sometimes intermediate between the two parents and sometimes nearer that of *V. vinifera*. Most generally certain characters of the liber and of the secondary wood, and especially those of the primary wood, are nearer *V. vinifera*. In the roots, on the other hand, these characters are nearer the other parent and are in accordance with the power of resistance to phylloxera and the excellent qualities as stocks possessed by these hybrids.

- On the use of seedling vines as scions, TRAUTT (*Prog. Agr. et Vit. (L'Est-Centre)*, 34 (1913), No. 46, pp. 625, 626, figs. 2).—The author here calls attention to some successful results secured during the past season in grafting grape seedlings on green shoots of old vines. At the beginning of June young plants which had only their cotyledons were trimmed like ordinary scions and inserted on the top of green shoots. The end of the shoot was wrapped with a small band of paraffin paper secured with raffia. The completed graft was then covered with a small paraffined paper bag in order to preserve the humidity. The parts united in about 2 weeks' time after which the young plants grew vigorously. By October the union was hardly visible and the shoot was about 3 meters long.

The application of this method for the rapid propagation of new varieties is suggested.

**The reconstruction of vineyards without grafting.** C. OBERLIN (*Weinbau u. Weinhandel*, 31 (1913), Nos. 28, pp. 287, 288; 29, p. 297; 30, pp. 307, 308; 31, pp. 317, 318; 32, pp. 327, 328; 33, pp. 337, 338; 34, p. 347).—After a general survey of the results secured in reconstituting phylloxera infested vineyards in Europe the author concludes in substance that, although the use of American grape stocks may be the best means of reconstituting the vineyards in the warmer parts of Europe, the use of grafted vines is too costly and complicated a process for cold climate regions such as Alsace-Lorraine, where it is necessary to plant the grape sufficiently deep to protect the grafts from frosts. He calls attention to the relative resistance of grapes grown by the cordon system to phylloxera as compared with grapes grown on individual stakes, as well as the greater ease with which cultural and spraying treatments may be given. With special reference to the industry in Alsace-Lorraine he suggests that the double arm cordon system be adopted and attention also given to the testing of direct-bearing American-European hybrids which are much more frost resistant than the grafted stocks.

**Some new or little-known Philippine economics.** O. W. BARRETT (*Philippine Agr. Rev.* [English Ed.], 6 (1913), No. 10, pp. 493-503, pls. 19).—Brief descriptions are given of a large number of native fruits and plants of more or less economic importance.

**The Kafir orange.** D. FAIRCHILD (*Amer. Breeders Mag.*, 4 (1913), No. 3, pp. 148-153, figs. 2).—Attention is here called to the Kafir orange (*Styrphnus spinosa*), an edible member of the strychnin producing genus which has been successfully grown in Florida and southern California. Notes are also given on other species of this genus which promise to succeed in our semitropical regions and which with a little improvement through hybridization and selection may offer a number of unique fruits to American growers.

**American medicinal flowers, fruits, and seeds.** ALICE HENKEL (U. S. Dept. Agr. Bul. 26, pp. 16, figs. 12).—This bulletin describes the following 13 plants, the flowers, fruits, or seeds of which are in greatest demand for medicinal purposes: Juniper (*Juniperus communis*), saw palmetto (*Serenoa serrulata*), wormseed (*Chenopodium anthelminticum*), pokeweed (*Phytolacca americana*), black mustard (*Brassica nigra*), white mustard (*Sinapis alba*), raspberries (*Rubus occidentalis* and *R. strigosus*), prickly ash (*Zanthoxylum americanum* and *Z. clavoherculis*), smooth sumac (*Rhus glabra*), American linden (*Tilia americana*), poison hemlock (*Conium maculatum*), Jimson weed (*Datura stramonium*), mullein (*Verbascum thapsus*), and elder (*Sambucus canadensis*).

Each plant is discussed with reference to its synonymy, habitat and range, description, collection, uses, and prices. Brief suggestions are given relative to the collection of flowers, fruits, and seeds.

**Experiments in bulb growing at the United States Bulb Garden at Beltingham.** P. H. DOSSERT (U. S. Dept. Agr. Bul. 28, pp. 21, figs. 21).—In 1908 the Bureau of Plant Industry established an experimental bulb garden at Beltingham, Wash., to determine the feasibility of growing the so-called "Dutch bulbs," including hyacinths, narcissuses, and tulips in the United States. This bulletin reports the progress and present status of the work, including the cultural practices thus far employed.

Generally speaking the results have been satisfactory, a high grade of bulbs having been produced. On the other hand, the Department is not prepared to recommend the commercial culture of "Dutch bulbs" in this country until further information is gained relative to climatic and soil requirements, cultural practices, and methods of harvesting, curing, storing, transporting, and marketing the crop.

**Weed extermination**, G. E. STONE (*Massachusetts Sta. Rpt. 1912*, pt. 2, pp. 35-40, pls. 3).—In this article the author discusses different methods of exterminating weeds from lawns. Descriptions of devices for applying arsenate of soda, cutting weeds, and spreading fertilizer are included.

**Legislation against the diseases and pests of cultivated plants in Ceylon**, T. PETCH (*Dept. Agr. Ceylon Bul. 6, 1913*, pp. 79-93).—This bulletin contains the text of regulations which have been issued in Ceylon under ordinances enacted for the control of native diseases and pests and for preventing the introduction of others.

### FORESTRY.

**Forest valuation**, F. RIEBEL (*Waldverrechnung. Vienna and Leipzig, 1912*, 2. ed., rev. and enl., pp. XI+527, pls. 2).—Part 1 of this work comprises a theoretical discussion of various factors which enter into the determination of the money value of a forest or a forest enterprise, consideration being given to the general economic, forest economic, and mathematical fundamental principles of forestry, and to the various methods of forest valuation. In part 2 the application of the theoretical knowledge relative to forest valuation to existing cases is illustrated by numerous examples.

**An economic study of acacias**, C. H. SHINN (*U. S. Dept. Agr. Bul. 9*, pp. 33, pls. 11).—In this bulletin the author discusses the economic importance of the leading acacias in various countries with the idea of bringing about more general planting in suitable regions in this country.

A study of the cultural requirements of the many species of acacia which have been grown as ornamentals in this country, chiefly in California, leads to the general conclusion that plantations properly located and managed are as likely to prosper in America as in other countries, where the various species have been a valuable source of tannin, gums, timber, etc. Attention is called to the fact, however, that thus far our knowledge relative to the success of acacias in this country is chiefly of a cultural nature. It is yet to be determined whether the trees can be produced under close-planted commercial conditions and whether the products can be harvested and marketed in competition with those produced cheaply abroad.

**Manihot caoutchouc**, A. ZIMMERMANN (*Der Manihot-Kautschuk. Jena, 1913*, pp. XI+342, figs. 151).—A treatise on the culture, exploitation, and preparation of the various Manihot rubbers. Other rubber-yielding species are considered in as far as the practices employed in handling them are of value for the culture of the Manihot species. The subject matter is based partially on a review of the literature of the subject and partially upon observations made in German East Africa, as well as on the author's personal investigations.

An extensive bibliography of the subject is appended.

**Device for planting white pine seed**, G. E. STONE (*Massachusetts Sta. Rpt. 1912*, pt. 2, pp. 31, 32, pl. 1).—The device here described consists of a hollow iron tube about  $\frac{1}{2}$  in. in diameter at the top of which is a funnel and to the bottom of which is attached a bent piece of strap iron about  $1\frac{1}{2}$  in. in width and thick enough to give the required rigidity. This is sharpened at the end like a chisel. The hollow handle is extended by means of a rubber tube so that when the blade is thrust into the ground the opening cones over the hole which is made when the handle is brought to a vertical position. The seed is planted by dropping it into the funnel at the top of the handle.

**Condition of experimental telegraph poles, treated and untreated, after eight years' service**, C. H. TEESDALE (*Engin. News, 70 (1913), No. 22*, pp. 1064-1066, figs. 4).—The work here reported was started in the summer of 1906.

when a large number of treated and untreated chestnut and white cedar poles were set up in experimental lines in cooperation with the American Telegraph and Telephone Company. The previous results of this test have been noted (E. S. R., 25, p. 344). In the present report an outline is given of the experimental treatments, together with the results secured after a test of 8 years.

As a result of this experiment it appears that the average life of the untreated seasoned and green southern white cedar poles in this line will not exceed 4 to 8 years. Seasoned poles set untreated showed a larger percentage of removals than the green poles. This is attributed to the length of time the seasoned poles were held before they were set. The chestnut poles were found to be in a much better condition than the cedar. Some 63 per cent of the untreated poles were still only slightly decayed, while of the treated poles, excluding tar coating, 91 per cent were either sound or only slightly decayed. Good results were obtained with all preservatives, except tar. Coal-tar products gave better results than wood-tar products. The results obtained with the carbolineums were only slightly better than with coal-tar creosote. The southern white cedar poles brush-treated with good preservatives showed less decay than untreated chestnut poles but were decayed more than the treated chestnut poles. Fewer removals and fewer badly decayed poles were found in the portions of the line running through swamps and wet locations than in dryer situations. The worst conditions were found in cultivated fields and dry sandy situations.

The author concludes that, although brush treatments with a good preservative gave an increased life to poles sufficient to pay well for the cost of treatment, to be really effective the application should be sufficient to treat all the sapwood and in the case of chestnut probably some of the heartwood.

## DISEASES OF PLANTS.

An outline of some of the topics covered by the department of vegetable physiology and pathology since its inception, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 97-101*).—A bibliography of the more important papers published by the department since 1888 is given.

Diseases more or less common during the year, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 38-40*).—Brief notes are given on winterkilling of twigs and roots of apple trees and the occurrence of scab (*Pustuladum dendriticum*), apple fruit rots, bitter rot (*Gleosporium fructigenum*), and of white pine blister rust on currants. A large number of other diseases due to parasitic fungi are listed. In addition notes are given on some forest and shade tree troubles, among them a mottling of chestnut leaves, the killing back of twigs of elm, maple, ash, butternut, Norway spruce, and sycamore, root diseases of elm, maple, and oak, as well as winter injury to other species. It is stated that the winter of 1912 was one of the worst on record for the depth of freeze and that vegetation in general was in poor condition owing to drought.

Work of the botanical research laboratory and of the laboratory for plant diseases at Klosterneuburg, L. LINSBAUER, J. K. SCHECHNER, and F. ZWEIFELT (*Programm u. Jahresber. K. K. Hbh. Lehranst. Wein u. Obstbau Klosterneuburg, 1911-12, pp. 141-166, Abs. 6; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 7, pp. 1114, 1115*).—The first article noted herein is the regular report regarding observations made on various diseases of orchard and small fruits, grapes, vegetables, etc., and of studies on some physiological problems, a list of addresses and publications being appended. The second article noted is a short and more specific account, by Linsbauer, of some physiological investigations bearing upon the development and some



physiological aspects of certain grape diseases, including *Plasmopara*, *Pseudopeziza trachelipha*, and "Droah."

**Studies of plant diseases.** H. C. MÜLLE, E. MOLZ, and D. MORGENSTERN (Ber. Agr. Chem. Kontroll u. Vers. Stgt. Pflanzenkrank. Prov. Sachsen, 1912, pp. 67-76).—This is a condensed report on studies carried out on various diseases of grails, beets, potatoes, fruit trees, and garden vegetables, with a list of remedies and apparatus for their application tested and approved by the station.

**Notes on Cronartium coleosporioides and C. filamentosum.** E. P. METSKER (Phytopathology, 3 (1913), No. 3, pp. 167, 168).—The author reports the successful infection of *Castilleja miniata* with aediospores of *Peridermium stipitiforme* from *Pinus contorta*.

**Mosaic and allied diseases, with especial reference to tobacco and tomatoes.** G. H. CHAPMAN (Massachusetts Sta. Rpt. 1912, pt. 2, pp. 41-51).—A report is given of observations on this disease of tobacco and tomatoes which the author says he has been able to produce on other plants, such as ruscus, Jimson weed, etc.

The disease is held to be of physiological origin and is caused by the excessive activity of the oxidase and peroxidase enzymes in the plant and the partial loss of function of catalase. It is not considered due to any one enzyme alone nor to any special virus. It is infectious but not contagious, and does not occur in seed beds when new soil is used nor in properly sterilized seed beds.

Directions are given for the handling of the seed beds, the use of fertilizers, the choice of soils, etc., to reduce as much as possible the occurrence of this trouble. A bibliography is appended.

**Cucumber and tomato canker** (Gard. Chron., 3. ser., 54 (1913), No. 1333, pp. 167, 168, fig. 1).—This disease, due to *Mycosphaerella citrullina*, the same fungus which attacks muskmelons in the United States (E. S. R., 21, p. 148), is said to be widely spread in Great Britain, where it is causing considerable loss to tomatoes and cucumbers grown under glass, and it has recently been shown to occur on fruits of tomatoes grown in the open (E. S. R., 29, p. 847).

The fungus appears to be a wound parasite and is spread most rapidly by the pycnidiospores. On the tomato the symptoms which have been most frequently seen are the wilting of the whole or top part of the plant, and the appearance of brown sunken areas on some parts of the stem. These are generally within 1 or 2 in. of the soil, although in some instances the canker may be found farther up the stem.

Comparatively little is known regarding methods of prevention, but attention to the proper temperature and humidity of the houses and spraying with Bordeaux mixture, it is thought, would tend to prevent the serious occurrence of the trouble.

**White-heads or take-all of wheat and oats** (Bd. Agr. and Fisheries [London], Leaflet 273, 1913, pp. 1, fig. 1).—A brief description of this disease, *Ophiobolus graminis*, in its different aspects is given with a discussion of its prevalence, mode of attack, and prevention. It is said to flourish also on couch grass, *Bromus sterilis*, etc., requiring their suppression or control; likewise it is said to attack oats, rendering this crop unfit for rotation as a means of starving out the fungus. Blindness or abortion of the grain in the ear may be due to other causes named, but such cases may be recognized by the absence of the characteristic blackening at the base of the stem.

It is claimed that superphosphate of lime at the rate of 1½ cwt. per acre applied when the crop is young proved effective at Kew, and that in Australia iron sulphate at the rate of 1 cwt. per acre checked this disease.

**The barberry and its relation to black rust of grain.** H. T. GILSSOW (*Phytopathology*, 3 (1913), No. 3, pp. 178, 179).—Attention is called to a report on the disappearance of *Puccinia graminis* in Denmark following the application of the law relating to the destruction of barberries.

**The action of different luminous radiations on the formation of conidia on *Botrytis cinerea*.** F. and MME. F. MOREAU (*Bul. Soc. Bot. France*, 60 (1913), pp. 2-3, pp. 80-83).—The authors, studying the development of *B. cinerea* on carrot under a pure strong spectrum, found that conidia were formed under these circumstances only in the violet-blue portion of the spectrum. This result agreed with that obtained by Reidelmeister (*E. S. R.*, 23, p. 48), but disagreed with that reported by some other authors named.

**A bacterial rot of cucumbers.** O. F. BURGER (*Phytopathology*, 3 (1913), No. 3, pp. 169, 170).—A brief report is given of two years' investigations of a bacterial disease of the leaves and fruit of cucumbers.

On the fruit watery spots with brown centers appear, and later the cucumbers become soft and translucent. The first indication of infection on the leaves is shown by the presence of watery spots. Cultures made from the material showed the presence of a bacterium, and inoculation experiments demonstrated that this organism was the cause of the trouble.

Vines were reported as drying up without setting fruit, and this led to inoculation experiments on healthy flowers. These were found to turn yellow, wither, and dry up without developing any fruit.

The cultural characteristics of the organism, which is a species of *Pseudomonas*, are being investigated further.

***Corynespora* leaf spot of cucumbers.** W. GROSSER (*Illus. Schles. Monatsschr. bot. Gemüse u. Gartenbau*, 2 (1913), No. 8, p. 137).—A discussion is given of a disease of cucumbers said to cause great damage in England, but heretofore only sporadic in Germany, and attributed to *C. mazzii*.

In the absence of complete investigations as regards efficient and inexpensive means of control, the author recommends soaking the seed 4 hours in 0.5 per cent formalin solution before planting, also spraying the plant with 0.4 per cent Bordeaux mixture, as preventive measures. No remedy is offered as effective after the general outbreak of the disease.

**Fusarium or Verticillium on okra in North Carolina?** G. W. WILSON (*Phytopathology*, 3 (1913), No. 3, pp. 183-185).—In a previous publication (*E. S. R.*, 26, p. 844), a disease of okra attributed to *F. vasinfectum* was described. Later the identity of the fungus had been questioned, and the author reports somewhat more in detail upon the disease and its causal organism. The studies are said to show that the fungus was not a Verticillium but a Fusarium, as previously reported.

**Black heart of potatoes.** E. T. BARTHOLOMEW (*Phytopathology*, 3 (1913), No. 3, pp. 180-182, pl. 1).—The attention of the department of plant pathology of the Wisconsin Station has been called to a blackening of the tissues of potatoes. An examination of these tissues showed them to be sterile. Following this a laboratory experiment was conducted, and it was found possible to produce the condition if potatoes were taken from the storage cellar and exposed to a temperature of from 38 to 45° C. (98.4 to 113° F.) for from 18 to 48 hours. The blackening did not develop to the same extent in all the potatoes. The change apparently begins in the center and radiates toward the margin, and if the affected potatoes are allowed to remain 10 days or 2 weeks before cutting, the affected tissues in the center shrink, leaving a hollow with a black lining.

Further studies are being made on the physiological changes which cause the blackening, and for the present attention is directed to the disease and the importance of keeping potatoes at a uniformly low temperature.

Experiments relating to the control of potato scab, G. E. STONE and G. H. CHAPMAN (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 84-96, pl. 1*).—The results of experiments with various chemicals for the prevention of potato scab are given. These experiments were begun in 1908 and continued for 4 years, different substances being employed. The potatoes were grown in soil in tiles 23 in. in diameter, and the treatment consisted of sterilization and the use of formalin, potassium permanganate, sulphuric acid, sulphur, copper sulphate, carbon bisulphid, a commercial by-product called by the author "by-product A," etc.

Summarizing the results of the experiments, it is shown that many of the substances used had little effect in preventing scab, while others seemed to possess some value. Steaming the soil seemed to have but little effect on the production of scab. The best results were obtained by the use of by-product A in dry form, followed by sulphur treatment and by-product A in solution and steam heating. The by-product seems to act slowly and continuously as a germicide, and it is thought that it may prove efficient in the control of other fungi.

The relation of cane cultivation to the control of fungus diseases, J. R. JOHNSTON (*Porto Rico Sugar Producers' Sta. Circ. 3 (English Ed.), pp. 13*).—The author describes the various cultural methods that have been tested for growing cane, and points out methods to be adopted for the control of fungus diseases so far as any relation exists between them and the agricultural practices.

The black rots of the sweet potato, J. J. TAUBENHAUS (*Phytopathology, 3 (1913), No. 3, pp. 159-166, pls. 3*).—A study of the black rot of the sweet potato, described by Halsted (E. S. R., 2, p. 416) and since attributed to *Sphaeroma fimbriatum*, has been made, and the author has come to the conclusion that the disease is not due to this species, but is a sclerotium fungus, to which the name *Sclerotium bataticola* n. sp. is given. In order to distinguish this disease from the black rot caused by *Trichoderma koningi*, it is proposed to call it the charcoal rot of the sweet potato.

A third black rot of the sweet potato is described, which is said to be due to *Lasiodiplodia tubercicola*. For this the author proposes the name Java black rot, as this indicates the source from which the disease was first obtained.

Study of recent diseases of grapevines, their importance and treatment, V. C. M. DE ZCÚAGA (*Estac. Enol. Haro Mem., 1912, pp. 85-98*).—Giving the results of several years' study of arropollao or achaparrado (court-noué) of grapevines in the Rioja, Spain, the author states that this trouble although not very serious at present is more frequently met with on lowlands and levels and in valley bottoms than in higher portions of the valleys and on benches. Clayey, cold, compact soils appear to favor court-noué more than do loose stony or slaty soils, the percentage of moisture seeming to bear some relation to its appearance as do also abrupt temperature changes in winter and spring. Considerable differences are noted in the susceptibility of different varieties, Riparia and Berlandieri proving relatively resistant. It is thought also that vigorous growth in autumn tends to decrease the likelihood of this trouble in spring.

Downy mildew in Vaucluse in 1913, E. ZACHAREWICZ (*Rev. Vit., 40 (1913), No. 1025, pp. 171-174*).—Three outbreaks of downy mildew were noted in the Department of Vaucluse in 1913. Both copper sulphate mixed with powdered soap to the amount of 1.5 per cent each in water, and a mixture of 70 parts of sulphur with 30 parts of 20 per cent sulphosteatite, were used soon after rain with good results, as also was a treatment of powdered lime 55 parts, 20 per cent sulphosteatite 40 parts, and naphtha soap 5 parts, all these treatments be-

ing liberally applied. Employment of chemical fertilizers with some restriction as regards nitrogen is also claimed to prove helpful in producing a freer lineal growth of the shoots favorable to aeration and to the application of sprays. The chief reliance is placed upon copper sulphate as a basis of fungicidal treatment.

Mildew in 1913, A. CADORET (*Prog. Agr. et Vit.*, (Ed. l'Est-Centre), 34 (1913), No. 34, pp. 238, 239).—In continuance of previous reports (E. S. R., 21, p. 551) the author states that, believing both single and successive outbreaks of downy mildew to be favored by humidity, he tested the effects of 3 sprayings following showers or rains extending over several days in the latter part of May and the early part of June. Almost no injury resulted from mildew, while crops around suffered heavily. Similar tests on a neighboring vineyard showed, however, a loss of about 50 per cent, heavy dews being noted in this case. Further tests are contemplated.

A Botrytis disease of dahlias, M. T. COOK and C. A. SCHWARZE (*Phytopathology*, 3 (1913), No. 3, pp. 171-174, pl. 1).—During the past year the authors' attention was called to a root rot of dahlias in storage. The disease appeared to be most severe under warm, moist conditions, combined with poor ventilation, and was caused by a species of Botrytis corresponding very closely to the description of *B. cinerea*. Infections always take place through wounds, and it was impossible to secure the penetration of the fungus through the uninjured epidermis.

Some fungus diseases of trees, L. H. PAMMEL (*Proc. Iowa Acad. Sci.*, 18 (1911), pp. 25-33, pls. 4, figs. 2).—Descriptions are given of the heart rot of *Populus tremuloides*, due to *Fomes igniarius* and *F. applanatus*; the oyster fungus (*Pleurotus ulmarius*) on box elder and basswood; the root rot fungus (*Polyporus versicolor*) on maples, oak, apple, cherry, and other deciduous trees; the root rot of oak, due to *Armillaria mellea*; the spot of butternut and black walnut (*Gnomonia leptostyla*); and attacks of *Taphrina* on the Rocky Mountain hard maples.

Shade tree troubles, G. E. STONE (*Massachusetts Sta. Rpt. 1912*, pt. 1, pp. 12-33, pls. 7).—The author describes staghead and root injury to maple and other trees. Injury to cork cambium, sun scald, bleeding, injuries from snow, effect of grading on trees, and injuries from various treatments for protection against insect pests.

Chestnut blight, G. E. STONE (*Massachusetts Sta. Rpt. 1912*, pt. 2, pp. 33, 34).—A brief account is given of observations by the author on the spread of the chestnut blight and the injury which it is causing. This disease seems to be spreading in the Connecticut and other western valleys of the State, while the eastern central section of the State still remains comparatively free from the disease. Along with the blight there is said to be a deterioration of chestnut trees which is in no way associated with the blight fungus.

The blights of coniferous nursery stock, C. HARTLEY (*U. S. Dept. Agr. Bul.* 44, pp. 21).—The author describes the more common blights to which coniferous nursery stock is subject and offers suggestions for their control. Among those described are sun scorch, winterkilling, diseases due to parasite fungi, stem girdle, mulch injury, red cedar blight, and mechanical root injury.

Sun scorch, which is said to be the commonest summer trouble, results in the death of the roots before the tops are killed and is due to excessive water loss. Watering, shading, and the avoidance of crowding, as well as increasing the humus content of the soil should be adopted for the prevention of this injury.

Winterkilling is due to the drying out of the plants when the soil is frozen and may be prevented by the use of a light straw mulch or windbreaks.

Much injury follows the heavy mulching of the plants and may be avoided by the use of light mulches and spraying with Bordeaux mixture before the application of the mulch.

The fungus diseases described are needle cast due to *Lophodermium pinastri*, blight caused by *Pestalotzia funerea*, root rots due to *Rhizoctonia* sp. and stem girdle caused by a fungus which may prove to be *P. hartigii*. Notes are also given on the red cedar blight, concerning which but little is known, and recommendations are made for its control.

*Herpotrichia* and *Neopeckia* on conifers, W. C. STURGIS (*Phytopathology*, 4 (1913), No. 3, pp. 152-158, pls. 2).—The author reports having observed in northern Wyoming in 1902 the prevalence of a fungus on leaves and twigs of *Abies lasiocarpa* and *Picea engelmanni*. Later and in nearly the same locality what appeared to be the same fungus was found on *Pinus murrayana*. An examination made of the specimens collected showed that that occurring on the fir and spruce was *H. nigra*, while that on the pine was *N. coulteri*.

The damage caused by these two fungi is, so far as the author's observations go, very slight, but on account of the possibility of their causing the destruction of conifers in seed beds or later, attention is called to them, and both species are described and their synonymy given.

A new rust, G. E. STONE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 41-44*).—The occurrence in the State of the Cronartium form of *Peridermium strobi*, the cause of the white pine blister rust, is noted. The rust was observed on a block of 200 currant plants which had been introduced from a New York nursery. Nearly all the plants were infected, although a small block of black currants a quarter of a mile away showed no indication of the fungus, nor did a rigid examination of a plantation of 8-year-old pines reveal any signs of blister rust infection. As the black currants are not considered of any great economic importance the author suggests their destruction.

Spotting of rubber on the plantation, V. CAYLA (*Jour. Agr. Trop.*, 13 (1913), No. 145, pp. 221-223).—Referring to articles published by K. Bancroft (*E. S. R.* 29, p. 451) and others, the author gives a brief outline of the beginning and progress of this condition of rubber appearing in the various stages of its production, mentioning several organisms found in connection therewith.

An investigation of lime-sulphur injury, its causes and prevention, V. I. SAFRO (*Oregon Sta. Research Bul. 2, pp. 32, pls. 4*).—Attention is called to the uncertain usage of the term lime-sulphur injury, and on account of this indefinite use the author has carried on some investigations to determine what chemical ingredients of the lime-sulphur spray can be classed as injurious in a strict sense.

A series of experiments was conducted in which the various materials which go to make up the spray and the compounds which are liable to occur in the spray before and after its application were used. These were sprayed on potato and bean foliage as well as on the foliage and fruit of apples, pears, cherries, peaches, and plums. Considerable varietal susceptibility to lime-sulphur injury was noted, but it was found that the injury, in the proper use of the term, was caused by the calcium polysulphids and to a somewhat less extent by calcium thiosulphate. The other normal ingredients occurring in the lime-sulphur mixture, either before or after its application, were found to be harmless.

A test was made of a number of samples of lime-sulphur mixture to determine whether their specific gravity could be taken as an index of their possible injurious effect. It was found that the specific gravity alone of the lime-sulphur spray does not indicate to what extent sulphids are in solution and

that different experiments using the densities of different concentrates as bases for dilution can not be compared accurately, so far as spray injury is concerned.

In an investigation made of means for the prevention of lime-sulphur injury it was found that it could be prevented to some extent by a considerable dilution of the solution or by the use of substances that would render the sulphids insoluble. Among those tested were iron, copper, and zinc sulphates, sulphuric acid, and carbon dioxide.

The author considers self-boiled lime sulphur to be a mixture of lime and sulphur rather than a combination. Much of the injury attributed to lime-sulphur sprays he attributes to other causes, particularly to sunburn.

**Spreading capacity and adherence of sprays.** V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 23, pp. 778-780).—This is a brief general discussion of the constitution of sprays intended for ordinary protective purposes; also of those intended to be especially adapted to spreading on application or to adherence under adverse weather conditions, or to both these purposes.

**Preparation of alkaline sprays.** V. VERMOREL and E. DANTONY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 34 (1913), No. 24, pp. 745, 746).—The authors give formulas and directions for the preparation of Bordeaux and Burgundy mixtures claimed to possess superior qualities as regards both spreading and adhesion, casein and gelatin being employed for this purpose.

#### ECONOMIC ZOOLOGY—ENTOMOLOGY.

**Game protection and propagation in America.** H. CHASE (*Philadelphia and London, 1913*, pp. F+238).—A handbook of practical information for officials and others interested in the cause of conservation of wild life.

**Game law blue book.** C. B. REYNOLDS (*New York, 1913*, pp. 136).—A compilation of the game and fish laws of the various States and of Canada, revised to date.

**Rats and their extermination.** W. A. DALEY (*Pub. Health [London]*, 27 (1913), No. 1, pp. 23-28).—This paper draws attention to the public health aspects of the rat problem and the methods of destroying these pests.

**Rat proofing a municipal sewer system.** F. SIMESON (*Pub. Health Rpts. [U. S.]*, 28 (1913), No. 44, pp. 2283-2290).—A report of an investigation conducted with a view to finding a practical method of rat proofing the sewer system of San Francisco.

**A history of the game birds, wild fowl, and shore birds of Massachusetts and adjacent States.** E. H. FORBES (*Boston: Mass. Bd. Agr., 1912*, pp. XVI+622, pls. 37, figs. 108).—Following a brief introduction (pp. 1-35) the subject is dealt with under the headings of (1) a history of the birds now hunted for food or sport in Massachusetts and adjacent States (pp. 39-396); (2) a history of the game birds and other birds hunted for food or sport, which have been driven out of Massachusetts and adjacent States, or exterminated, since the settlement of the country (pp. 399-491); and (3) the conservation of game birds, wild fowl, and shore birds (pp. 497-595).

**Insect porters of bacterial infections.** C. J. MARTIN (*Brit. Med. Jour.*, 1913, Nov. 27/4, pp. 1-8, figs. 12; 2715, pp. 59-68, figs. 12).—A summarized account delivered before the Royal College of Physicians.

**Insect record for 1912 in Massachusetts.** H. T. FERNALD (*Massachusetts Sta. Rpt. 1912*, pt. 2, pp. 85-87).—The year was made notable by the large number of different insects, some 400 forms, about which inquiries were made. Among the more important were various plant lice; the elm leaf beetle; the bronze birch borer (*Agrilus anxius*); the apple tree tent caterpillar; the apple

twig borer; the bud moth; the juniper scale (*Diaspis carueli*), a European pest which was found in such abundance on plants imported from abroad as to seriously injure them; the box leaf miner (*Monarthropalpus bursi*) which seriously attacked box hedges; the cottonwood leaf beetle (*Lina scripta*) which fed on the leaves of poplars in a nursery at Agawam; the chestnut borer (*Leptura zebra*), observed in connection with the chestnut bark disease; the fall army worm, which was unusually abundant and destructive; and termites (*Termes flavipes*) which attacked the stems of growing cabbages and corn plants.

General survey of the insect fauna of the soil within a limited area near Manchester; a consideration of the relationships between soil insects and the physical conditions of their habitat, A. E. CAMERON (*Jour. Econ. Biol.*, 8 (1913), No. 3, pp. 159-204, pls. 2, figs. 3).—Part 1 (pp. 159-187) of this paper consists of a general survey of the insect fauna of the soil at the grounds of the experimental laboratory, Fallowfield; part 2 (pp. 187-199) deals with the soil insects and the physical conditions of their habitat.

Phytopathological report for the year 1912, P. MARCHAL (*Bul. Agr. Algérie et Tunisie*, 19 (1913, No. 3, pp. 193-199).—This report deals with the occurrence of the more important insect pests of the year.

Report of the entomologist, E. BALLARD (*Nyasaland Dept. Agr. Ann. Rpt.* 1913, pp. 29-32).—This report deals largely with the occurrence of insect pests during the year.

List of insect pests, H. MOASTATT (*Pflanzer*, 9 (1913), No. 6, pp. 288-296).—This is a classified list of the more important insect enemies of plants and plant products in German East Africa, with the nature of their injury.

[Cranberry insects in 1912], H. J. FRANKLIN (*Massachusetts Sta. Rpt.* 1912, pt. 1, pp. 225-234).—This is a report of observations and study made of cranberry insects on Cape Cod in 1912 in continuation of those previously noted (E. S. R., 28, p. 352), and of which an account from another source has also been previously noted (E. S. R., 28, p. 854).

As regards the fruit worm (*Lineola vaccinii*) the author states that late holding of winter flowage is the surest method of control thus far discovered and that spraying as a remedy for it is still of doubtful practicability. There are, however, a few bogs which can not be winter flowed that will pay a moderate return if the fruit fly is kept within bounds. The experimental resanding of such a bog on May 23 to a depth of 1 in., the uprights being raked up through the sand when covered by it, was but partially successful, since numerous moths were observed on netting which covered the experimental plot and some 40 per cent of the berries which developed on this area were destroyed by fruit worms. The author thinks that the best treatment for this insect on such bogs would consist in the destruction of the remnant of the crop in the years when the severe injury either from frost or winter-kill occurs and that this could probably be most readily done by spraying with a 20 per cent solution of iron sulphate. It is his opinion that as a rule more is lost through injury done to the vine in harvesting a very light crop than is gained by saving and marketing the berries.

The flowed bog fireworm or blackhead cranberry worm (*Rhopobota vaccina*) is the source of but little or no damage on bogs that are not winter flowed. The main cause of serious infestation by this pest is the killing and driving ashore of its natural enemies by flowage, as was pointed out in the report of the previous year. Through collections made by sweeping it was determined that spiders are the most numerous of all forms capable of destroying the fireworms. Comparisons showed that the dry bog had far more spiders and also

somewhat larger number of parasitic insects than did any of the winter flowered bogs even as late as August 20. The information obtained in the study of this insect emphasizes the importance of spraying with arsenical poisons before the infestation starts. Since most bogs should be sprayed several times each year to control fungus diseases, Paris green for use against the fireworm may be applied at the same time by adding 1 lb. to every 50 gal. of Bordeaux mixture. A brief description is given of the most successful treatment for the control of the cranberry insects through the application of water to the bogs which has come to the author's attention. He states that there is little doubt that any bog can be freed from this fireworm by treating it for a few years as a strictly dry bog.

The season's observations of the cranberry girdler (*Crambus hortellus*) are said to sustain in every particular the conclusions concerning it reached the previous two years. Resanding every other year is usually sufficient to prevent infestation by it. Reflowing for a week or 10 days right after picking is still a standard remedy for it where sufficient water is available.

Methods of controlling mill and stored grain insects, together with the habits and life histories of the common infesting species, G. A. DEAN (*Kansas Sta. Bul. 189, pp. 139-236, figs. 62*).—The first part of this bulletin deals at some length with the use of heat as a means of controlling mill insects, and reports experiments conducted, many of the details of which have been previously noted from other sources (E. S. R., 29, p. 253). The author presents illustrations, temperature records, and other data relating to mills which have used heat successfully. Hydrocyanic acid gas treatment for mill insects is next taken up and described at length. This is followed by a discussion of carbon bisulphid fumigation as a means of destroying insects injurious to grain stored in granaries and small elevators. The last part of the bulletin (pp. 198-236) is devoted to a discussion of the habits and life history of the common stored grain and mill insects, some 25 of which are described and figured.

"The only practical and efficient method at present known of completely controlling all classes of mill-infesting insects is by the application of high temperatures, and this method has been so developed within the last 3 years that it promises to revolutionize the present inadequate methods. In Kansas the heating of several mills has absolutely proved that no stage of a mill insect, even in the most inaccessible places, could withstand the heat, and several mills in Ohio, Illinois, Nebraska, Iowa, Indiana, southern Canada, and elsewhere have corroborated the practicability and the efficiency of heat as a means of controlling mill insects. . . . Many insects do not yield readily to hydrocyanic acid gas, but no mill insect can withstand for any length of time a temperature of from 118 to 122° F. . . .

"A mill that has sufficient radiation to heat it in winter to a temperature of 70° can readily be heated in summer to a temperature of from 118 to 122°. With the heat method there is no possibility of injuring the floors, belts, or mill machinery and there is practically no danger from fire. The Mutual Fire Prevention Bureau, representing eight of the principal millers' insurance companies, recommends the heating system for effective fumigation against all mill and stored grain infesting insects. If a mill is infested with Mediterranean flour moth, hydrocyanic acid gas is a very effective treatment, but in no case where it is possible to use heat is the hydrocyanic acid gas treatment recommended."

The destruction of injurious insects by vegetable parasites, L. LE MOULT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), Nos. 34, pp. 239-246; 35, pp. 265-277; 36, pp. 297-308*).—This is a general review.



**Tests of insecticides, H. T. FERNALD** (*Massachusetts Sta. Rpt. 1912, pt. 2, pp. 88-91*).—Several insecticides were tested during the year but no attempt was made to draw final conclusions as to their value.

Entomoid, claimed to be a combination of lime-sulphur and a miscible oil applied at the strength of 1:50 killed many San José scales, but a sufficient number were left so that the trees were about in their former condition at least 3 months earlier than was the case in 1911. Nicine, used in large amounts in drills to protect corn from wireworms and about the base of onions to protect them from the onion maggot, had no injurious effect on the plants but did not give absolute protection from a light infestation of wireworms nor afford a high degree of protection from the maggot. Soil Fumigant and insecticide was applied to parts of the same corn plots as Nicine to protect corn from wireworms but the infestation proved to be insufficient to enable a determination of its value. Tests with two commercial brands of zinc arsenite applied at the rate of 1 lb. to 10 gal. of water to elm, maple, and wild cherry leaves showed that both adhered well and destroyed the elm leaf beetle larvae, but injured the leaves of all three trees. Both applications are believed to have been too strong.

The common house roach as a carrier of disease, R. C. LONGFELLOW (*Amer. Jour. Pub. Health, 3 (1913), No. 1, pp. 58-61*).—Attention is called to the role of this insect in the dissemination of various species of bacteria.

Notes on the occurrence of the woolly aphid, *Schizoneura lanigera*, in the core of apples, T. R. HEWITT (*Jour. Econ. Biol., 8 (1913), No. 2, pp. 85-91, fig. 1*).—The author has found the core of Newtown Pippins from California that were purchased from a Dublin fruit dealer to be infested with *S. lanigera*. In 3 of 7 apples examined the aphids were alive. It is stated that externally the apples did not appear to be infested, except for a little mildewy appearance of the eye, but on being cut in two through the core the aphids were easily seen. There is a small channel connecting the eye with the core in this apple and through this channel the aphids gained access to the core. This channel, however, is not common in many varieties.

"The core presented a white moldy appearance, due to the woolly secretion of the aphids. In the apples in which the aphids were dead the cores were moldy, due to the growth of some fungus, which was probably secondary. The damage done to the core was very slight, as the aphids did not appear to have pierced through the carpels. In one apple, which was rather more badly infested than the others, the seeds presented a damaged appearance, but the flesh of the apple was not injured in any instance."

The economic importance of such infestations is found in the possible dissemination of this pest in apples to uninfested orchards or districts.

Report on peach aphid investigations during late winter and early spring, 1912. C. B. HARDENBERG (*Agr. Jour. Union So. Africa, 6 (1913), No. 2, pp. 224-235*).—This is a report of studies of the life history and of control experiments with the black and green peach aphids in the Transvaal.

The black peach aphid is said to be attacked by a hymenopterous parasite and 2 syrphids, *Xanthogramma scutellaris* and an undetermined species. The green peach aphid suffers in addition from the attack of a third species of syrphid fly, and 3 species of lady beetles have been found to feed upon it. Observations of the life cycle of *X. scutellaris* are reported.

Tobacco extract in a solution containing about 0.082 per cent nicotine is the most effective strength and no advantage is gained in using a stronger solution. The green peach aphid can be effectively kept under control by 3 thorough sprayings about 5 days apart, the first being applied as soon as the first leaf open out.

**The San José scale in Tennessee with methods for its control.** G. M. BENTLEY (*Tenn. Bd. Ent. Bul. 8, 1913, pp. 24, figs. 211*).—This account has been previously noted from another source (*E. S. R., 29, p. 53*).

**Some preliminary notes on a scale insect infesting the banana in Fiji.** F. P. JERSON (*Dept. Agr. Fiji Bul. 5, 1913, pp. 7; abs. in Rec. Appl. Ent., 1 (1913), Ser. A, No. 4, p. 136*).—This paper relates to the infestation of bananas by the transparent coconut scale (*Aspidiotus destructor*).

**The Abutilon moth (*Cosmophila erosa*).** F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 126, pp. 10, pls. 5*).—This is a summarized account of the present knowledge of the Abutilon moth, the larvæ of which defoliate okra, hollyhock, and Abutilon in Virginia and the District of Columbia. It has also been observed feeding on *Hibiscus exultans* and *Malva rotundifolia* in the District of Columbia and on cowpeas in Mississippi. Technical descriptions are given of its several stages.

The application of a spray consisting of 40 per cent nicotine sulphate  $\frac{1}{4}$  oz., whale-oil soap  $\frac{1}{4}$  lb., and lukewarm water 5 gal. resulted in the destruction of 95 per cent of the larvæ. A second application resulted in the complete eradication of the pest.

A bibliography of 10 titles is appended.

**The red-humped caterpillar (*Schizura concinna*).** E. J. VOGLER (*Mo. Bul. Com. Hort. Cal., 2 (1913), No. 9, pp. 654-657, figs. 2*).—Considerable damage to the apple, walnut, etc., is often caused in the central portion of California by this pest.

**The fruit tree leaf roller (*Archips argyrospila*).** G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 2 (1913), No. 9, pp. 637-647, figs. 6*).—This leaf roller is said to have ruined much of the fruit in several orchards in San Diego County, Cal.

**A new sugar-cane pest.** C. FULLA (*Agr. Jour. Union So. Africa, 3 (1913), No. 6, pp. 931-933*).—This paper deals with a caterpillar which webs together the immature leaves forming the spike of the cane and, living within the protecting tube so formed, feeds upon the inner surface of the outer leaf forming the spike.

**The Hessian fly.** T. J. HEADLEE and J. B. PARKER (*Kansas Sta. Bul. 188, pp. 83-138, figs. 15*).—In this bulletin the authors have brought together the results of their personal investigations in Kansas, together with a review of the more important findings of other investigators. The subject is dealt with under the headings history and distribution, habits and life history, seasonal history, natural checks, injury, and measures of control. A diagram depicting the life history is included (see fig. 1).

It is stated that six different outbreaks of the Hessian fly have occurred in Kansas during the 41 years that it is known to have been present there. During the last and greatest of these outbreaks, that of 1908, 10,000,000 bushels of wheat were destroyed.

The length of its life cycle, is variable, ranging under field conditions from 45 days to 12 months or more, dry weather and cool weather lengthening it, and moist and warm weather shortening the period. "The number of broods is variable. In 1908 main-spring, supplementary-spring, midsummer, mid-fall, and supplementary-fall broods were determined. In dry summers it is likely that midsummer and supplementary-fall broods would not appear, and it is likely that in very dry years, particularly when the drought begins early, the supplementary-spring brood might be eliminated."

Under measures of control mention is made of grazing, rolling or brushing, mowing, fly-proof wheat, spraying and dusting infested plants, intermittent wheat culture, and trap planting as of little, if any, value. The useful methods include the destruction of the fly in infested stubble by burning or plowing

under, the destruction of volunteer wheat, and late sowing. "The sources of the flies which form each of the broods are variable, for the members of a single brood came from as many as three different places—old stubble, regular crop, and volunteer wheat. The measures of control must be of such a nature as to close up all these sources of supply. Temperature and moisture are the only climatic elements that appear materially to influence the fly. Low temperature or low moisture, or both acting simultaneously, always retard its development.

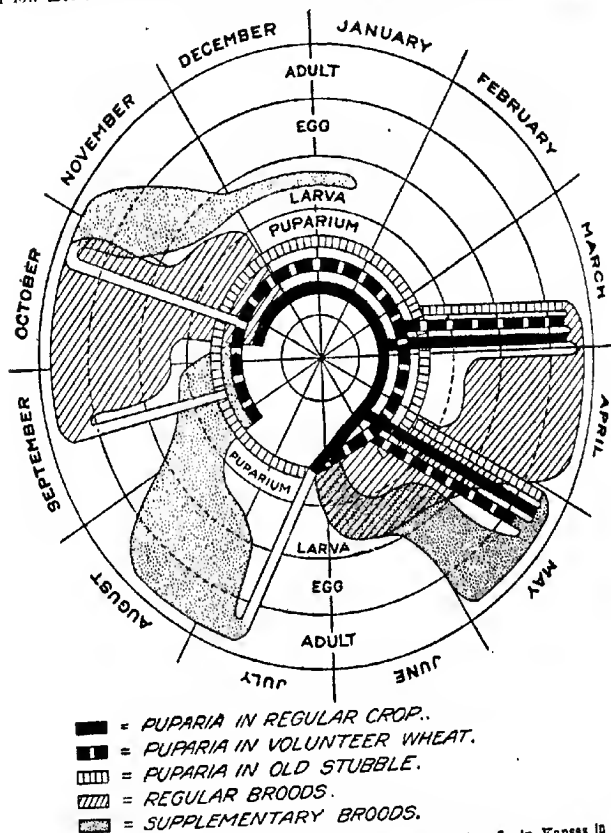


FIG. 1.—Diagram to represent the number of broods of Hessian fly in Kansas in 1908, the period of their appearance, and the sources from which they came.

and may, if extreme, destroy it. High temperature and high moisture are universally favorable to its development. Although both predaceous and parasitic enemies always reduce the fly, their action is so irregular and so rarely sufficient that dependence upon them for protection is folly. . . . In the fall the central shoot of the young plant is stunted and killed; if the attack be serious enough the whole plant and the whole field may be destroyed. Ordinarily the slow destruction of the central shoots causes the tillers to grow vigorously, giving the

field a dark green appearance. In the spring, the maggots interfere with the sap flow, cause the heads partly or completely to fall to fill, and so weaken the stalks that many break and fall before harvest. The fly infesting the old stubble can best be destroyed by plowing the stubble under so carefully and deeply that when the ground is packed down into a good seed bed for wheat, there will be at least 4 in. of soil between the stubble and the surface. The growth of volunteer wheat is a menace, and should not be tolerated before the regular crop is sown. In average years with proper preparation of the seed bed, the date of safe sowing is at least as early as the date on which wheat should be sown to make a maximum yield if no fly were present."

A schedule of procedure based upon the life history studies here reported is outlined which if it is followed it is thought will enable the farmer to escape serious fly damage and give the best possible chance to obtain a maximum crop. A map of Kansas which shows the date of safe sowing calculated directly from 1907-8, 1908-9, and 1909-10 experimental sowings is included, from which the safe-sowing date may be readily determined for the various counties.

The red clover gall gnat (*Amblyspatha ormerodi* n. sp.), R. S. MacDON-  
GALL (*Jour. Bd. Agr. [London]*, 20 (1913), No. 3, pp. 225-230, pls. 4).—A great destruction of red clover by this cecidomyiid is reported to have taken place during the winter and spring of 1912-13, complaints having been received from a large number of counties. In practically all the samples received red maggots were found either in the soil surrounding the plants or, on dissection, in the spoiled plants.

It is thought that a fungus of the genus *Sclerotinia* and an eelworm (*Tylenchus devastatrix*) may be associated with the gall midge in the injury.

A jumping maggot which lives in cactus blooms (*Acucula saltans* n. g. and n. sp.), C. H. T. TOWNSEND (*Canad. Ent.*, 45 (1913), No. 8, pp. 262-265).—A new dipteran collected from a columnar cactus, probably *Cercus* sp., at the western base of the Andes some 40 miles inland from Lima, Peru, is described as *A. saltans*. This maggot causes the petals to shrivel before they open.

Mosquito extermination and its problems, E. WINSHIP (*Engin. Rec.*, 67 (1913), No. 18, pp. 490-492, figs. 2).—A discussion of the subject by a sanitary engineer in which he outlines the essentials of success in ridding communities of the pest.

The natural host of *Phlebotomus minutus*, F. M. HOWLETT (*Indian Jour. Med. Research*, 1 (1913), No. 1, pp. 34-38, pl. 1, fig. 1).—The author finds the wall lizard, or gecko, to be the natural host of *P. minutus*. He states that there is no doubt but that this fly has a distinct preference for biting lizards as compared with man, and that it is in fact primarily a parasite of the lizard. A *Phlebotomus* (probably *P. minutus niger*) has once been observed biting an agamid lizard, and a sand fly has been observed twice biting the head of the common toad (*Bufo melanosticticus*).

Recent literature, especially the medical literature, on sand flies (*Phlebotomus*, *Simulium*, *Ceratopogoninae*), K. FRIEDERICH (Ztschr. Wiss. Insektenbiol., 9 (1913), Nos. 1, pp. 26-31; 4, pp. 133-138).—This review follows a list of 63 recent publications on the subject.

Control measures for use against flies, L. VAILLARD (*Rev. Sci. [Paris]*, 51 (1913), II, No. 7, pp. 193-206, figs. 7; *Rev. Gén. Sci.*, 24 (1913), No. 9, pp. 352-358; *Off. Internat. Hyg. Pub. [Paris]*, *Bul. Mens.*, 5 (1913), No. 8, pp. 1313-1336).—A detailed discussion.

The distance house flies, blue bottles, and stable flies may travel over water, C. F. HODGE (*Science*, n. ser., 38 (1913), No. 989, pp. 512, 513).—This paper describes a plague of flies on the cribs of the waterworks, situated 14, 5, and 6 miles, respectively, out in Lake Erie, from the city of Cleveland, Ohio.

"The only explanation for the above facts seems to be that the flies are blown at least 6 miles off shore, and that they gather on the cribs as temporary resting places."

An unusual outbreak of *Stomoxys calcitrans* following floods, C. FULLER (*Agr. Jour. Union So. Africa*, 5 (1913), No. 6, pp. 922-925).—A discussion of an unusual outbreak of the stable fly in South Africa.

The maggot fly pest in sheep, H. S. MAJOR (*Agr. Gaz. N. S. Wales*, 24 (1913), No. 8, pp. 645-653).—A discussion of this pest has been previously noted from another source (*E. S. R.*, 29, p. 658).

The bean stem maggot, R. W. JACK (*Rhodesia Agr. Jour.*, 10 (1913), No. 4, pp. 545-553, pls. 4).—The author here discusses the life history, bionomics, and injury caused by *Agromyza fabalis*, a native African species which is generally distributed south of the Zambesi. This dipteran is said to be the most serious drawback to the successful cultivation of cowpeas and certain other kinds of beans in this territory.

Experiments for the control of the onion maggot, H. T. FERNALD and A. I. BOURNE (*Massachusetts Sta. Rpt. 1912, pt. 1, pp. 171-179*).—This paper presents the details of experiments in which a number of insecticides and repellents were tested with a view to determining their efficacy in controlling the onion maggot.

The experiments with carbon bisulphid, Nicline, powdered hellebore, a hellebore decoction, a soap wash, carbolized lime, and kerosene emulsion gave what may be considered as negative results. More satisfactory results were obtained in the control of the maggots from the application of carbolic acid emulsion, made by dissolving 1 lb. of soap in 1 gal. of water, adding 1 lb. of crude carbolic acid, and churning as in kerosene emulsion. Applications along the rows by means of a force pump without a nozzle at strengths of 1:30, 1:40, and 1:50 parts of water decidedly checked the infestation in the rows to which it was applied. It is estimated that the cost of this material and labor varies from \$3 to \$12 per acre for each application, according to the strength used. Since it would be necessary to make at least 3 and probably 4 applications, the cost would amount to from \$35 to \$50 per acre.

"The whole experiment indicates (a) that no entirely effective method of controlling the onion maggot has as yet been discovered; (b) that many of those thus far recommended are of little value, at least on large fields; (c) that the cost of treatment with most of them is so great as to render them unavailable for large areas. Finally, the most promising line of investigation seems to be the discovery of something which will effectually repel the insects or destroy the maggots, and which can be applied either as a part of the planting process or in connection with cultivation, thus avoiding the necessity of special treatments by combining these with usual methods of cultivation."

The manzanita Serica (*Serica anthracina*), E. O. ESSIG (*Mo. Bul. Com. Hort. Cul.*, 2 (1913), No. 8, pp. 622, 623, fig. 1).—This beetle is reported to be a source of serious injury in Eldorado County, California, through its defoliation, especially of the prune and apple. In some instances the trees have been killed by the constant and complete defoliation.

The application of arsenate of lead, at the rate of 8 lbs. to 100 gal. of water to which 8 lbs. of lime has been added, as soon as the beetles appear in the spring is recommended.

A critical discussion of the Halticini attacking Cruciferae in central Europe, F. HEIKERTINGEA (*Centbl. Bakt. [etc.]*, 2. Abt., 36 (1912), No. 1-5, pp. 98-127, figs. 18).—The several parts of this paper deal with the genera and species of flea beetles attacking crucifers and the nature of their injury, the cultivated crucifers attacked, tables for the determination of the species of

Phyllotreta and Psyllodes infesting Cruciferae in Germany, Austria, and Switzerland, etc.

**The destructive Eleodes (*Eleodes omisssa borealis*),** E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, p. 627, fig. 1).—This tenebrionid beetle is reported to have been the source of injury to orange trees around Bakersfield and to have stripped a large number of apricot and plum trees in an orchard at Wasco, Kern County.

**The fruit tree bark beetle (*Scolytus rugulosus*),** E. O. ESSIG (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 9, p. 653).—The author records the occurrence of the shot-hole borer in apricot trees at Ontario, Cal., this being the first authentic report of its occurrence in the State.

**Investigations of the fungus-growing fruit tree bark beetle *Xyleborus (Anisandrus) dispar* and its food fungus,** O. SCHNEIDER-ORELLI (*Centbl. Bakt. [etc.]*, 2. Abt., 38 (1913), No. 1-6, pp. 25-110, pls. 3, figs. 7; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 8, pp. 259-261).—This is a report of a detailed study of the bionomics of the scolytid beetle *X. dispar* and contains the results of numerous experiments regarding its feeding habits. The experimental propagation of its food fungus *Monilia candida* is also discussed.

The females emerge from their burrows in the spring and soon commence a new system of burrows, the walls of which become lined with a dense mass of this so-called ambrosia fungus upon which the larvae feed. The spores are said to be spread through being taken up by the adult beetles, and later regurgitated from the stomach.

**A billbug injurious to small grain (*Sphenophorus discolor*),** H. S. SMITH (*Mo. Bul. Com. Hort. Cal.*, 2 (1913), No. 8, pp. 619-621, figs. 3).—Considerable injury is said to have been caused by *S. discolor* to all varieties of barley, wheat, and oats in the vicinity of Sacramento.

**Black brood in bees,** I. L. SERBINOW (*Vestnik Russk. Obshch. Pchelovod.*, 112, No. 11, pp. 426-429; *abs. in Rev. Appl. Ent.*, 1 (1913), Ser. A, No. 8, pp. 436).—This article relates to European foul brood and its occurrence in Russia.

**A preliminary account of a chalcidid of the genus *Tetrastichus* which parasitizes *Ceratitis* and *Dacus* in West Africa,** F. SILVESTRI (*Atti R. Accad. Insci. Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1915), 11, No. 5, pp. 205, 206).—A new species of *Tetrastichus* reared from *Ceratitis atletica*, *C. piffardii*, and *Dacus cucumarius* in Nigeria, Kamerun, Gold Coast, and Dahomey is described under the name *T. piffardii*.

**A new braconid of the genus *Microdus* from Canada,** C. H. RICHARDSON, JR. (*Canad. Ent.*, 45 (1913), No. 7, pp. 211, 212).—A new braconid reared from the res-spotted bud moth at Bridgetown, Nova Scotia, is described as *Microdus cellana*.

**The enemies of plant pests: The Aphelininae,** R. G. MERCET (*Trab. Mus. N. Nat. [Spain]*, 1912, No. 10, pp. 306, figs. 68).—A synopsis of this important group of chalcidid parasites, including tables for the separation of genera and species, is presented.

**Collembola damaging pine trees,** W. E. COLLINGS (*Jour. Econ. Biol.*, 8 (1913), No. 2, p. 99).—The author reports finding that *Seira nigromaculata* causes the young needles on shoots of *Pinus sylvestris* to wither and drop. The insect seems to be attracted by the resinous gum, and as soon as the new bud opens makes its way to the bases of the young leaves and commences to bite into the same; after a short time the needles turn yellow and ultimately fall away. Sometimes only part of the base is destroyed and part of the bud remains in a damaged condition, but in most cases the new buds are completely ruined.

**Experiments in the use of sheep in the eradication of the Rocky Mountain spotted fever tick, H. P. Woon (U. S. Dept. Agr. Bul. 45, pp. 11).**—This is a report of experiments conducted to determine the value of sheep in destroying *Dermacentor venustus* as brought to attention by L. D. Fricks in an article previously noted (E. S. R., 23, p. 658).

Two experiments, the first with 20 sheep, the other with 2 sheep, were carried through. The first was conducted in a country known to be well infested with ticks, being adjacent to the foothills and well supplied with bushes of various sorts, a growth of small pines, a few fairly large trees, and several streams of water. The conditions were such that there could have been few, if any, ticks on the sheep at the time they were driven into "ticky" country. During the course of the experiment, which was commenced on June 3, two thorough examinations were made, commencing June 10 and 23, respectively, of each sheep to locate the living ticks and to remove the dead ones. Numerous other, but less thorough, examinations were also made, when any dead found were removed and the living ones noted. In the second experiment ticks were collected by dragging cloths over the ground, and then placed upon the sheep—on the first June 20 and on the other June 25, the examinations also being made twice a day. The details of the results are presented in both tabular and descriptive form.

The experiments show that sheep are good collectors of ticks, 6 sheep with heavy wool having picked up 72 females and 47 males in 11 days. Thus in "ticky" country which is favorable to the herding of sheep it would be advantageous to use them as collectors of ticks, since by dipping the sheep once in 7 days it would seem that much good could be accomplished. In order to bring about the greatest good it would be necessary to herd the sheep with a knowledge of the location of the ticks, since it is extremely doubtful if they would be of much importance as collectors of ticks if allowed to run free. Of 33 female ticks placed upon a sheep in the second experiment but one fed sufficiently to lay eggs. There were in all, however, 6 females which stood a fair chance of engorging, so that it is difficult to say what percentage of females that get on a sheep in nature will engorge to repletion.

Several limitations to the practicability of using sheep exclusively in the eradication of the spotted fever tick, namely, (1) the necessity of eliminating all other live stock except that on which the ticks could be destroyed at weekly intervals by dipping or otherwise; (2) the impracticability of heavily stocking a given area with sheep and attempting to carry the usual number of other live stock on the same pastures; and (3) the necessity of cutting down all vegetation higher than a sheep's back, emphasize the great importance of following the plan of dipping domestic animals which is successfully under way. Thus while sheep may be used under some conditions of the work, the main reliance must be upon the dipping of horses and cattle.

### FOODS—HUMAN NUTRITION.

**Bouillon cubes—their contents and food value compared with meat extracts and homemade preparations of meat, F. C. Cook (U. S. Dept. Agr. Bul. 27, pp. 7, figs. 10).**—The composition and nature of commercial bouillon cubes are discussed on the basis of analytical data, in comparison with commercial meat extracts and similar preparations and homemade broths and soups.

The author's summary follows.

"One-half to three-fourths of bouillon cubes is table salt. The cubes are not concentrated beef or meat essence, as many people believe. They are valuable stimulants or flavoring agents, but have little or no real food value. Bouillon cubes, therefore, are relatively expensive.

"Semisolid meat extracts sold in jars are not concentrated beef. They are stimulants and flavoring adjuncts and have only a slight food value, owing to a small amount of protein (muscle-building food) which they contain. They are more expensive than homemade soups.

"Fluid meat extracts are dilute solutions of semisolid meat extracts. They are sold in bottles and are flavored. They are more expensive than the semisolid meat extracts because they contain more water.

"Commercial meat juices are largely deprived of their most valuable food constituent—the coagulable protein, or muscle-building food. They are similar to fluid meat extracts, and some makes cost more.

"Homemade meat broths are more nutritious and provides more meat extracts, protein, and fat at less expense than the commercial preparations.

"Homemade meat and vegetable soup contains much more food and is therefore much cheaper than the bouillons or soups prepared from commercial cubes, extracts, or juices."

Bouillon cubes, F. C. COOK (*Jour. Indus. and Engin. Chem.*, 5 (1913), No. 12, pp. 989, 990).—Analytical data are reported regarding the bouillon cubes referred to above.

"Bouillon cubes on the market at present consist of about 5 per cent of water, 1 to 4.5 per cent of ether extract (fat), and 50 to 74 per cent of ash which is practically all sodium chlorid. The nitrogen bodies and undetermined organic material amount to 20 to 40 per cent. The phosphoric acid ( $P_2O_5$ ) varies from 0.4 to 1.8 per cent, the total nitrogen from 2.1 to 3.6 per cent, and the total creatinin from 0.49 to 1.67 per cent.

"A cube prepared largely from meat extract gives high total phosphoric acid ( $P_2O_5$ ), total nitrogen, and total creatinin figures. The amount of nitrogen precipitated by absolute alcohol and hydrochloric acid is also markedly higher than in a cube containing much plant and little meat extract. . . .

"Bouillon is a clear broth, the basis of which is meat; consequently a true bouillon cube should show high creatinin and high total nitrogen figures, and should be prepared entirely, or largely from meat stock or meat extract in addition to the salt and fat present. Several of the cubes on the market contain much more plant than meat extract and are not entitled to the name 'bouillon' unless modified."

Notes on rare fishes sold for food in east London, F. J. STUBBS (*Zoologist*, 4 ser., 17 (1913), No. 202, pp. 377-381).—These notes were collected during the preparation for the Whitechapel (Stepney Borough) Museum of an exhibit of the food fishes for sale in east London and include, besides a description of the method of making casts of the fishes, brief notes on the habitat and appearance of the less common varieties. Among the latter are the greater weever (*Trachinus draco*), beryx (*Beryx decadactylus*), sea bream (*Pagellus centronotus*), ide (*Leuciscus idus*), sille smelt (*Argentina silus*), lesser ling' (*Molva dipterygia*), *Macrurus rupestris*, *Malacocephalus beris* (*Macrurus beris*), and lump sucker (*Cyclopterus lumpus*).

Size of the sample necessary for the accurate determination of the sanitary quality of shell oysters, G. H. SMITH (*Amer. Jour. Pub. Health*, 3 (1913), No. 7, pp. 705-708).—According to the author, consistent results can not be obtained with less than 15 oysters. A standard of purity for oyster liquor should be established similar to the standards in use for water and milk.

Studies of phosphatids, particularly those in egg yolk, J. EPPLEB (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 4, pp. 233-254).—Analytical data are reported and discussed.



The gluten content of flour, K. BUBAL (RAUER) (*Ztschr. Gesam. Getreidek.*, 5 (1913), No. 6, pp. 171-179).—General and analytical data are given regarding the amount of gluten in different flours and its relation to their quality.

A preliminary study on the conditions which affect the activity of the amylolytic enzymes in wheat flour, C. O. SWANSON and J. W. CALVIN (*Jour. Amer. Chem. Soc.*, 35 (1913), No. 10, pp. 1635-1643).—The effects of temperature, the duration of the digestion period, the optimum proportion of flour and water, and the effect on the production of reducing sugars of chemicals were studied, including sulphuric acid, sodium hydroxid, dibasic potassium phosphate, and sodium chlorid in varying concentrations and quantities.

The experiments, according to the authors, showed that "the optimum temperature for the production of the maximum amount of reducing sugars is very near 65°; that the best proportion of water and flour lies between 1:4 and 1:10, and that there is little difference between these two limits. It has also been shown that the largest transformation takes place during the first hour; approximately 88 per cent of the total change occurs during the first hour. The inhibiting effect of various chemicals has been shown. The inhibiting action is greater toward straight flour than toward low-grade."

Some points in the making and judging of bread, ISABEL BEVIER (*Trans. Ill. Bul.*, 10 (1913), No. 25, pp. 44, pls. 7).—As the author points out, the characteristics of good bread are symmetry of size and shape, bloom and crispness of crust, and a tender, elastic crumb of fine grain. The conclusions drawn from the investigation were in effect the following:

Recipes differ widely as regards nonessentials, sugar, salt, and shortening, but agree as to the proportion of 1 cup of liquid to 3 of flour. Yeast is a plant, and so subject to laws of plant growth as regards food and moisture. If in good condition, yeast probably does not influence the flavor of bread. Water is the best liquid as regards flavor. Because of the small proportion used and the fact that almost any form of milk is largely water, little effect on flavor is produced by the use of skim milk or buttermilk. Both seem to contribute to tenderness of crumb.

Salt prevents a flat taste, retards fermentation, and, used to excess, causes loss of color in crust and of tenderness in crumb. Sugar darkens the color of the crust. Within limits, it increases the volume of the loaf. Salt and sugar combined in proportion of 1:2, respectively, improve both flavor and volume.

Bread making is an art that demands careful attention to certain essential details such as character, temperature, and amount of yeast, condition and amount of flour, time and temperature of fermentation and baking. The material of pans is a question of choice. Tin seems to yield the best results in common practice. Covered and uncovered pans have not been tried enough for definite conclusions.

The process of bread making for winter wheat flour differs from the process for spring wheat flour in that winter wheat requires more liquid, a slack dough, is much better with 3 risings instead of 2, and should be allowed to finish proving in the oven.

A new method of keeping bread fresh and its significance with respect to the night work of bakers, J. R. KATZ (*Chem. Weekbl.*, 10 (1913), No. 25, pp. 488-495, figs. 3).—Experiments on the vapor tension and water content of bread crust showed that so long as the moisture did not exceed 18 per cent the crust retained the characteristics of freshness. In an atmosphere with 85 per cent humidity bread crust remained unaltered for a long time.

Bread remained fresh from 10 to 15 hours when kept in a chamber which contained a shallow pan filled with saturated salt solution, and in which air circulation was maintained by means of a small ventilating fan. The eff

regulation necessary was the addition of water to the brine to maintain the desired concentration. In the author's opinion, such apparatus is particularly well suited to small bakeries, and by its use he believes that it might be possible to do away with night work.

The grinding of corn meal for bread, F. P. DUNNINGTON (*Alumini Bul. Univ. Pa., 3. ser., 6 (1913), No. 4, pp. 521-532*).—The data discussed in this paper were reported in an earlier publication (E. S. R., 28, p. 369).

[Banana recipes], O. W. BARRETT (*Philippine Agr. Rev. [English Ed.], 6 (1913), No. 9, pp. 451, 452*).—In a discussion of the use of bananas recipes are given for preparing bananas and plantains for the table.

Hickory nuts and hickory nut oil, G. O. PETERSON and E. H. S. BAILEY (*Jour. Indus. and Engin. Chem., 5 (1913), No. 9, pp. 739, 750*).—An analysis of hickory nut meats is reported in connection with a study of the oil and its characteristics.

According to the authors, "the food value of hickory nuts is high; the oils from the two species of hickory nuts, *Carya ovata* and *C. amara*, are practically identical and are similar to cotton-seed oil; the oil retains the flavor of the hickory nut, and is practically equal to olive oil; [and] the possibility of extracting the oil on a commercial basis should be further investigated."

[Analyses of food, beverages, and drugs], W. HANSON (*Bien. Rpts. State Dairy and Food Comr., State Chem. and State Dairy and Food Bur. Utah, 1911-12, pp. 191*).—The results of a large number of analyses of foods, beverages, and drugs are reported and discussed, and reports of the 2 years' work are resented.

Food and drug and weight and measures laws of the State of Nevada, with the rules and regulations adopted for the enforcement of the same Nevada Sta. Bul. 80, pp. 22).—The full text of the state laws, rules, and regulations is given.

Wisconsin dairy and food laws and decisions of courts, J. Q. EMMY (*Madison, Wis.; Dairy and Food Comr., 1913, pp. 92*).—A compilation of the state laws regarding the inspection, manufacture, and sale of food and dairy products, amended in 1913, together with court interpretations and rulings.

A study of the use of ice and other means of preserving food in homes, R. WILLIAMS (*Jour. Amer. Med. Assoc., 61 (1913), No. 12, pp. 932-935, figs.*).—In this paper, read in the section on preventive medicine and public health of the American Medical Association, Minneapolis, June, 1913, the results are reported of a study of upwards of 100 homes in 5 sections of Rochester, N. Y., socially and economically different. Information was collected regarding the use of milk, means for caring for it, the size, make, and kind of refrigerator used, the amount of ice used weekly and yearly with its cost, and similar topics, and temperature measurements were made of refrigerators, living rooms, and basars. From his studies the author considers that the following conclusions are warranted:

"The temperatures of cellars or living rooms in dwelling houses are not sufficiently low during the warm months of the year to protect milk and other perishable foods from rapid bacterial decomposition. Therefore an efficient refrigerator in the home is a necessity.

"Most of the refrigerators in common use are almost worthless and grossly economical. There is a large field for the manufacturer who will make a properly insulated and efficient box which can be sold at a moderate price.

"If more economical methods of ice manufacture and distribution were employed, the cost of ice to the consumer could be materially lowered. If to this saving were added that which would result from proper ice box construction,

refrigeration vastly superior to that now found in the average home could be had for at least one-fourth the present cost."

The paper is followed by a discussion.

**Cooking and heating with electricity, C. T. PHILLIPS** (*Architect and Engineer*, 34 (1913), No. 3, pp. 93-99, *Agas* 7).—Electric cooking equipment of different sorts is described and data summarized regarding the rates for electricity for cooking purposes in different parts of the United States and the cost of cooking by this method.

**The food factor in some sociologic problems** (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 16, p. 1463).—In discussing the problem of food in relation to sociological problems, the following statement is made:

"Perhaps our sociologists have not sufficiently appreciated in the past that the occurrence of conditions in which the support of the family and the provision of even the barest necessities prevent the attainment of any variety and interest in life and almost enforce a monotonous existence reacts in a variety of ways on the health and efficiency of the community through the diet factor referred to. The essays at amelioration and reform must accordingly take into account possible changes in the mode of feeding which might set free a greater proportion of the income for other things than food. Dietary habits need to be dealt with in this field quite as much as ignorance and the 'stultifying influence of the surroundings.'"

**[Increased cost of maintenance of children]** (In *Special Report Chicago Nursery and Half-Orphan Asylum, 1869-1913*. Chicago [1913], pp. 12, 13).—Since its establishment in 1874 the institution has cared for more than 4200 children for periods varying from a few weeks to a long term of years.

A gradual increase in the cost of support per child has been noted. The average cost of maintenance from 1874 to 1883 was \$79.98 per child per year; from 1884 to 1893, \$88.68; from 1894-1903, \$101.45; and from 1904 to 1913 \$140.60. These estimates "do not take into account the numerous contributions of food, clothing, and general equipment which have made it possible to keep the expenses down to these figures. Nor do they include the maintenance repairs, and improvements of the building."

**Cost of living in Nova Scotia, J. W. RAGSDALE** (*Daily Cons. and Trade Rpt.* [U. S.], 16 (1913), No. 157, p. 134).—Data are given regarding the kinds and amounts of food consumed by a family consisting of a man and woman and 4 children.

[Using the usual factors for the composition of food, etc., it has been calculated that the food purchased for this family (calculated to be equal to 37 men) supplied 116 gm. protein and 3,325 calories of energy per man per day.]

**Food prices in London—an inquiry into present conditions as affecting the poorer classes of workers, J. C. PRINGLE** (*London: Charity Organ. Soc.*, 1913, pp. 36).—A large amount of statistical data is summarized and discussed with reference to the kind of foods purchased and the prices paid by families of moderate income. A number of family budgets are included.

The pamphlet as a whole supplies much information regarding the living conditions of the poorer families of the working class in London.

**[Luncheon for women clerks employed in the Bank of England], E. M. HARVEY** (In *Minutes of Evidence taken before the Royal Commission on the Civil Service, April 10-25, 1913, with Appendices*. London: Govt., 1913, p. 561).—A brief statement regarding the improvement in health which has followed the serving of a luncheon free of cost to women employees in the Bank of England. Whereas numerous cases of neuritis in the arm or some other form of nerve trouble before this was done were prevalent, "complaints of this character are now very rare."

[*Dietaries and accounts for Poor Law Unions, England and Wales*] (*Local Govt. Bd. [Gt. Brit.], Workhouse Regulation (Dietaries and Accts.) Order, 1900, pp. 27; Rpt. Dept. Com. Local Govt. Bd. [Gt. Brit.] Poor Law Orders, 1 (1913), pp. 8, 15, 16, 37-47, 83-88*).—In the general order issued to the Guardians of the Poor of the several Poor Law Unions in England and Wales, and commented upon and in part reprinted by the committee on the revision of Poor Law Orders, regulations are given regarding dietaries and accounts and rations are outlined in detail. Brief instructions are appended to the list of rations and recipes are given for the preparation of a large number of dishes. Forms for ration accounting are also included.

**Diet social service in dispensary work.** F. H. KLAER (*Med. Rec.*, [N. Y.], 84 (1913), No. 18, pp. 792-795).—This is an account of the results of work carried on in connection with the Social Service of the Outpatient Department and the Medical Dispensary of the Hospital of the University of Pennsylvania.

The patients or families visited by the dietitian fell into two general classes, viz. individual patients suffering with various digestive disturbances or diseases requiring special diets, and families requiring a readjustment of finances, food, and habits of eating, because of debts, malnutrition, and sickness.

Often individual cases became family cases because it was impossible to correct dietary conditions for one member without changing those of the whole household. It was not always possible to obtain satisfactory cooperation, but in the majority of cases the visitors were able to introduce noteworthy improvements in the health and also in the financial condition of the family by teaching more economical ways of buying and utilizing food as well as better methods of preparation, and thus prevented as well as cured many unnecessary cases of malnutrition.

**A food clinic** (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 16, pp. 1462, 1463).—A summary of a paper by W. M. ROACH, presented\* at the Congress on School Hygiene, held in Buffalo, N. Y., in August, 1913. Some account is given of the favorable effects of feeding school children in Philadelphia.

**Report to the local government board on bacterial food poisoning and food infections.** W. G. SAVAGE (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., 1913, No. 77, pp. 89, pl. 1*).—In this digest of data the author summarizes and discusses information regarding the different kinds of food poisoning, both bacterial and that attributed to ptomaines.

According to the report, three considerations should be borne in mind, namely, the association of some outbreaks at least with actual disease of the animals whose flesh was eaten; the probability that in other outbreaks uncontaminated food had become infected from the tissues or intestinal contents of food animals in which bacterial invasion was present, as may happen when a slaughterhouse is used as a place for the preparation of sausages and similar meat foods; and that the spreading of disease by bacterial infection, when present, may be affected by lack of cleanliness and care in handling, preparing, and storing foods.

An appendix contains a list of British and continental outbreaks of food poisoning, recommendations of the local government board on outbreaks, and a bibliography.

**The relation of diets and of castration to the transmissible tumors of rats and mice.** J. E. SWEET, ELLEN P. CORSON-WHITE, and G. J. SAXON, (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 181-191).—A generous and an insufficient diet were compared, the conclusion being that both susceptibility to transplantable tumors and the rate of growth of transplanted tumors may be influenced positively or negatively by diet—the rate of growth being slower and the number of retrogressions being higher on the low than on the normal diet.

**Mixed diet and metabolism** (*Med. Rec.* [N. Y.], 84 (1913), No. 17, pp. 759, 760).—This is a brief discussion of the physiological necessity of a varied diet as regards both a sufficient supply of all the nutrients and a variety of food material. The relations of a too simple diet to such diseases as diabetes and irregular gout and to anaphylaxis as shown by anemia, malnutrition, asthenia, etc., are also indicated.

**The mineral content of the daily diet**, HORNE-MANN (*Ztschr. Hyg. u. Infekt. Krankh.*, 75 (1913), No. 3, pp. 553-568).—The author found in studies with adult men that the amounts of calcium and iron oxides in a daily diet supplying 557 gm. dry matter were respectively 1.72 gm. and 156 mg. With adult women receiving 396 gm. dry matter, the corresponding values were 0.91 gm. and 91 mg., and with a 6-year-old boy receiving 325 gm. dry matter, 0.67 gm. and 57 mg. He is of the opinion that the amounts of calcium and iron supplied by the diets were sufficient.

**The normal presence of boron in animals**, G. BERTHAUD and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 3, pp. 248-251; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 599, 11, pp. 854, 855).—Using a method described in a previous article,\* the authors report the presence of small amounts of boron in the organs and tissues of several animals. It is the more easily detected in the hair, horns, bones, liver, and muscles.

**The presence of boron in animals**, G. BERTHAUD and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 9, pp. 732-735; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 606, 1, pp. 423, 424).—In continuation of the work reported in the previous article, the authors report finding boron in 27 different species of animals, and conclude that it exists normally in small amounts in the bodies of all animals, being more common in the species of marine origin.

**The presence of boron in milk and eggs**, G. BERTHAUD and H. AGULHON (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 26, pp. 2027-2029; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 610, 1, p. 934).—The presence of 0.08, 0.1, and 0.2 mg. of boron per liter of human, ass's, and cow's milk, respectively, and of 1 mg. per kilogram of dried material from fowl, turkey, and goose eggs is reported.

The frequent occurrence of this element in animal and vegetable products leads the authors to ask the question whether boron, like iron, may not play an indispensable part, possibly catalytic, in the living cell.

**The metabolism after meat feeding of dogs in which pancreatic external secretion was absent**, F. G. BENEDICT and J. H. PRATT (*Jour. Biol. Chem.*, 15 (1913), No. 1, pp. 1-35).—The increase in the total metabolism of animals and man resulting from the ingestion of food of various kinds has often been observed, and, as the authors point out, there have been two distinct theories as to the reason. One assumes that the increase in metabolism is mainly due to the mechanical processes in digestion, and the other that the increase is due to the specific dynamic action of foodstuffs, that is, that portion of the heat produced which appears as free heat and does not benefit the cells. The one attributes the increased metabolism mainly to mechanical causes; the other, to chemical processes.

Experiments on the metabolism of nitrogen and on carbon dioxide production are reported, the results showing, according to the authors, "that there is no large energy transformation incidental to segmentation, peristalsis, glandular activity of stomach, liver, and intestine, and the movement of the unabsorbed food through the intestinal tract. The attempt to explain the increased metabo-

\* *Ann. Chim. Analyt.*, 15 (1910), No. 2, pp. 45-53; *Bul. Soc. Chim. France*, 4, ser. 2 (1910), pp. 90-99.

field following the ingestion of food by the theory that the increase is a consequence of such movements is, therefore, not justifiable."

Some observations on metabolism in connection with an experimental march, C. H. MELVILLE, W. W. O. BEYERIDGE, and N. D. WALKER (*Jour. Roy. Army Med. Corps*, 19 (1912), No. 6, pp. 661-673, figs. 71).—Observations were made of the body weight, the amount, nitrogen content, and energy value of the food consumed, the liquids drunk, and the nitrogen eliminated in the urine and feces in the case of 3 men taking part in the march. From a study of the results obtained the authors deduct the following practical points:

"If a man has to go short of water for 1 day the effect on the water available for perspiration, that is, for temperature regulation, may persist even in a well-trained man for about 48 hours." Even if "a plentiful supply of water is available on the next day [it] will only tend to increase his urinary secretion, not to redress at once the disturbance in water content of his dehydrated tissues." A similar effect results from an uneven allowance of water. "It is extremely important, therefore, to regulate the supply not only from day to day, but also on the course of every day."

The water supply of a man in an untrained condition needs more careful regulation than that of a man in good physical condition.

Report on two experimental marches carried out for the purpose of feeding a scale of field service rations; together with an account of some observations on nitrogen balance, etc. (*London: Govt., 1913, pp. 61 + [2], pls. 1*).—This blue book gives full data regarding an earlier experimental march (E. S. R., 25, p. 266) as well as the one noted above.

## ANIMAL PRODUCTION.

Commercial feeding stuffs, W. J. JONES, JR., ET AL. (*Indiana Sta. Bul.* 169, pp. 71-326).—This reports analyses of the following feeds: Wheat bran, middlings, shorts, low grade flours, mixed wheat products, rye middlings, buckwheat bran, buckwheat middlings, buckwheat mixed feed, cotton-seed meal, cotton seed cake, cotton-seed hulls, linseed meal, linseed cake, distillers' dried grains, brewers' dried grains, gluten meal, gluten feed, corn germ meal, hominy feed, corn meal, corn bran, dried sugar beet pulp, alfalfa meal, blood meal, beef scrap, tankage, proprietary stock and molasses feeds, calf meals, poultry feeds, and condimental stock and poultry feeds.

There is included a synopsis of the Indiana feeding stuffs law, together with a classification of feeding stuffs, and comments on the various feeds and their manufacture.

Use of the bitter acorn in the feeding of domestic animals, A. CORNIER (*Bul. Agr. Algérie et Tunisie*, 19 (1913), No. 13, pp. 273-276).—Bitter acorns were subjected to a process of torrefaction and desiccation and thus rendered available as a palatable and nutritive feed for domestic animals. The composition of the fresh acorns is reported as follows: Water 55.3, protein 2.5, fat 2.9, carbohydrates 34.8, crude fiber 4.4, and ash 1 per cent; and the digestible nutrients as protein 2, fat 3.9, carbohydrates 31.3, and fiber 2.7 per cent.

Rations for farm stock (*Bd. Agr. and Fisheries [London], Leaflet* 79, pp. 23).—This publication contains a general discussion of the principles of nutrition and the compounding of rations. Rations applicable to British conditions are given for dairy cows, both summer and winter feeding; for fattening cattle and sheep; for calf feeding; and for ewes, pigs, work horses, and mares with foal.

On the question of the nitrogen retention from the feeding of urea, E. GAFFE (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 86 (1913), No. 5, pp. 347-355).—

This is a continuation of work previously noted (E. S. R., 26, p. 262). In the feeding of urea to dogs and swine, the results indicated that although there was a heavy loss of nitrogen there was some nitrogen retention in the animal body.

**Nutrition of the embryonic chick, I, II, III, H. W. BYWATERS and W. B. ROUX** (*Jour. Physiol.*, 45 (1913), No. 6, pp. XL, XLI; 46 (1913), Nos. 2, pp. XI, XXI; 3, pp. XXXIII, XXXIV).—Investigations made of the changes occurring in the white of the egg during incubation indicate that the percentage of water diminishes at a regular rate during the earlier period of incubation, falling less regularly after the fifteenth day. There was less absorption of the protein than of the water. The ratio of coagulable to uncoagulable protein remains practically constant, ranging from 1:5.7 to 1:7.9. The presence of free sugar usually disappears after the seventh day, whereas in infertile eggs it slightly increases. The relation between the uncoagulable protein in egg white and its combined carbohydrate after different periods of incubation was found to be practically constant.

The average daily loss in weight of eggs during incubation was about 0.5 gm. It was fairly constant in the same egg, but varied greatly in different eggs. "In the case of sterile eggs, the daily loss in weight for the same egg is practically constant throughout the whole period of incubation, [but] with fertile eggs, the daily loss may fall slightly until about the middle of the period of incubation and then it begins to rise until at the end it may be half as much again as at the commencement of the incubation." It is deemed possible to ascertain the fertility of the incubating egg by studying the daily loss in weight.

It is shown that as regards the assimilation of egg white the ratio of the coagulable to the uncoagulable protein, i. e., of albumin to ovomucoid, remains practically constant. This is explained on the assumption that "the proteins of egg white are absorbed at the same relative rate, possibly by being previously converted into diffusible substances by enzymes secreted by the embryo itself."

**A respiration apparatus for sheep and swine, F. TANGL** (*Archiv. Kitzb.*, 16 (1913), No. 4, pp. 467-481, figs. 7).—A report of the construction of a respiration apparatus combining the principles of the Pettenkofer-Voit, Atwater-Beech, and Tigerstedt apparatus.

**Twenty-five years of German animal production, HANSEN** (*Illus. Landw. Ztg.*, 33 (1913), No. 48, pp. 442-444, figs. 4).—A résumé of the progress of animal breeding and production in Germany, in which it is shown that there has been an increase in the number of horses of 28.2 per cent, of cattle 27.7 per cent, of mutton sheep 137.7 per cent, and of goats 23.1 per cent, with a decrease in wool sheep of 63.3 per cent.

**Methods of cattle raising and management under modern intensive farming** (*Arch. Deut. Gesell. Züchtungsk.*, 1913, No. 17, pp. 70-93).—This is a complete review and discussion of the methods of cattle raising in operation in the Province of Saxony and portions of Prussia under the modern intensive farming system. The use of home-grown feeds and of barn feeding are emphasized. The financial cost, yields, and profits are itemized and discussed in detail.

**Treatise on zootechny.—III, The bovine, P. DECHAMBRE** (*Traité de Zootechnie.—III, Les Bovins*, Paris, 1913, pp. 581, pl. 1, figs. 50).—In this volume the author considers in detail the classification, origin, development, and breed characteristics of all the common breeds of cattle as well as of many rare and obsolete breeds of Europe, Asia, and South America. A special study is made of the conformation, body measurements, and ethnological characters of these breeds. There is also included a discussion of the production of beef in France.

Italy, Argentina, the United States, and other countries. The feeding, care, and management of breeding stock are treated in full, together with a study of the most approved methods of beef production. Formulas and methods for determining, by means of measurements of the animal on foot, the dressing percentage and net weight of the dressed carcass are also included.

The author discusses the selection of dairy cattle under the heads of conformation, quality, mammary system, and empirical signs or marks. Under the latter, he treats of the importance of the esutcheon as an index to milk secretion, and explains the various forms of esutcheons and hair swirls as described by F. Guenon.

**Breeding cattle in French Guinea.** ALDIGÉ (*Rev. Gén. Méd. Vét.*, 22 (1913), No. 259-260, pp. 337-373, figs. 5).—The native breeds of cattle of French Guinea are described and their utility value as beef and milk producers and the opportunities for improvement through the introduction of the zebu are discussed.

**On the breeds, breeding, and utility value of the cattle of Dutch East Africa.** G. LICHTENHELD (*Pflanzenz.*, 9 (1913), No. 6, pp. 261-279).—This article treats of the body measurements, breed characteristics, and utility value of the native breeds of cattle of Dutch East Africa.

**The Creole cattle of Salta.** T. R. GARCÍA (*Bolet. Min. Agr. [Buenos Aires]*, 15 (1913), No. 6, pp. 675-682, figs. 11).—The author describes the native cattle of Argentina, commenting on their utility value and on the opportunity for improvement through the introduction of pure-bred beef sires. The three principal types of native cattle are Chiqueños, Serranos, and Fronterizos.

**On beef production [in Argentina].** E. LAUTTE (*Bolet. Min. Agr. [Buenos Aires]*, 15 (1913), No. 6, pp. 683-689).—The author comments on the extraordinary growth and demand for Argentina meat products, and states that the abnormal demand is producing a spirit of speculation. Statistical reports of exports to the United States and other countries are presented.

**The frozen meat industry of Argentina.** P. BRASCHI (*Bolet. Soc. Rural Argentina*, 1913, July-Aug., pp. 247-291, figs. 16).—This is a statistical report of the frozen meat industry of Argentina and of the export trade with foreign countries. The industry has undergone a remarkable development and growth in the past few years, and the trade now reaches throughout America, Europe, and the Orient. The relative rank of the various meat-exporting countries is given, showing that for most of the meat products Argentina leads, with Australia and New Zealand as close competitors.

**Foreign meat in London.** C. R. LOOP (*Daily News and Trade Rpts.* [N. S.], 1913, No. 246, p. 379).—It is noted that almost the whole of the foreign supply of beef imported into the United Kingdom is now derived from Argentina and Australia. The supply from the United States diminished from 1,000,000 lbs. in 1908 to 685,000 lbs. in 1912. The average retail price for beef on the London market is estimated as follows: Sirloin, 19 cts. per pound; rib, 18 cts.; silver side, 16 and 17 cts.; and steaks, 21 to 28 cts.

**The shrinkage in weight of beef cattle in transit.** W. F. WARD and J. E. BARNES (*U. S. Dept. Agr. Bul.* 25, pp. 78).—Shrinkage weights were obtained on cattle shipped from various points in the Southwest and Northwest. A general summary of the 3 years' work is shown in the table following.



*Shrinkage on beef cattle in transit.*

Cattle.	Number of cattle.	Average weight at origin.	Average gross shrinkage.	Average fill at market.	Average net shrinkage.	Percent shrinkage to live weight at origin.
		Pounds.	Pounds.	Pounds.	Pounds.	Percent.
Range steers in transit less than 36 hours.	197	791			24	3.0
Range steers in transit 36 to 72 hours.	882	1,146	89	25	64	5.6
Range cows in transit over 72 hours.	169	1,118	88	27	61	5.4
Range cows in transit less than 24 hours.	1,721	838	60	39	20	2.4
Range cows in transit 24 to 36 hours.	1,521	895	76	39	37	4.1
Range cows in transit 36 to 72 hours.	275	1,031	96	46	50	4.8
Range cows in transit over 72 hours.	177	1,010	70	39	31	3.0
Mixed range cattle in transit less than 24 hours.	1,511	791	37	22	15	1.9
Mixed range cattle in transit 24 to 36 hours.	822	838	72	18	54	6.4
Mixed range cattle in transit 36 to 72 hours.	622	954	75	39	36	3.8
Mixed range cattle in transit over 72 hours.	988	129	80	29	51	3.9
Range calves in transit less than 24 hours.	773	185	6	7	1	0.5
Range calves in transit over 24 hours.	772	193	6	11	5	2.6
Mixed canted cattle in transit less than 24 hours.	164	1,303	67	16	51	3.9
Mixed canted cattle in transit 24 to 36 hours.	1,853	1,167	85	37	48	4.1
Mixed shag-fed cattle in transit less than 24 hours.	696	1,164	78	52	26	2.2
Mixed shag-fed cattle in transit 24 to 36 hours.	169	1,204	101	58	43	3.6
Cottonseed-canned steers in transit 36 to 48 hours.	1,288	1,071	72	14	58	5.4
Beef-pulp-fed cattle in transit 60 to 120 hours.	1,046	1,370	100	25	75	5.4
Beef-pulp-fed cattle in transit 36 to 120 hours.	2,641				54	

It is concluded from these investigations that "the shrinkage of cattle in transit depended very materially upon (a) the conditions existing at the time of shipping and upon the treatment received during the drive to the loading pens; (b) the length of time the cattle were held without feed and water before being loaded; (c) the nature of the fill which the cattle had before loading, a great loss in weight being experienced with succulent grass, beet pulp, or silage; (d) the weather conditions at the time of loading and while in transit; (e) the character of the run to market, slow, rough runs causing a greater shrinkage; (f) the kind of treatment they received at unloading stations; (g) the time of arrival at market, the fill being small if they arrived just before being sold, and cattle that were shipped a long distance and arrived at market during the night usually not filling well; whereas if they arrived the afternoon before or about daylight of the sale day, they generally took a good fill; and (h) the climatic conditions at the market.

"An exceedingly large fill at market is not desired as it will detract from the selling price. The shrinkage on calves may seem small, but under normal conditions it holds about the same proportion to their weight as is found with grown cattle. The difference between the shrinkage of cows and steers is not as great as is ordinarily supposed. Steers will usually shrink somewhat less than cows of the same weight. The shrinkage during the first 24 hours is greater proportionately than for any succeeding period of the same duration. The shrinkage of cattle was found to vary in direct proportion to their live weight when conditions were the same and all other factors were equal. The shrinkage of range cattle in transit over 70 hours during a normal year is from 5 to 6 per cent of their live weight. If they are in transit 36 hours or less the shrinkage will range from 3 to 4 per cent of their live weight. The shrinkage of fed cattle does not differ greatly from that of range cattle for equal periods of time. It varied from about 3 per cent with all of the silage-fed cattle

and 4.2 per cent with the corn-fed cattle, when both classes of these animals were in transit for less than 36 hours, to 5.1 per cent for the pulp-fed cattle which were in transit from 60 to 120 hours. Cattle fed on silage have a large gross shrinkage but usually fill so well at the market that the net shrinkage is small. Pulp-fed cattle shrink more in transit than any other class of cattle, and also present a greater net shrinkage.

"The shrinkage on cattle is proportionately smaller for each 12 hours they are in transit after the first 24-hour period is passed. For a long journey the common method of unloading for feed, water, and rest is to be preferred to the use of 'feed and water' cars. Cattle should be weighed before being loaded wherever practicable, since a comparison of this weight with the sale weight will show the net shrinkage. Moreover this weight at point of origin may be of material benefit to the shipper in case of a wreck or a very poor run to market."

**Sheep farming in North America**, J. A. CRAIG, *New York, 1913, pp. A1111+392, pls. 25, figs. 3*.—The chapters included in this book, which is one of the Rural Science Series, are the position of sheep in profitable farming; sheep farms and their equipment; breeds of sheep; formation and improvement of the flock; seasonal management; lambing; fattening; preparation of sheep for show; and diseases.

**Boulonnaise breed of sheep**, J. TRUONIEUX, *Journal, Agr. Pratiq., n. s. s., 26 (1913), No. 32, pp. 180, 181, pl. 1*.—This is a brief description of this breed of sheep and its distribution throughout France and portions of Europe. Its characteristics are hardiness and rustling and pasturing qualities, and its improvement and promotion is recommended.

**Fitting yearling wethers and lambs for exhibition**, H. F. HUMPHREY and F. KLEINHAINZ (*Wisconsin Sta. Bul. 232, pp. 26, figs. 12*). This bulletin is intended as a practical guide in the selection, fitting, and showing of yearling wethers and lambs for exhibition, but also reports experimental work in feeding.

In order to study the value of the various grain rations during two 3-year fitting periods wethers intended for exhibition at the International Stock Exposition were divided each year into 4 lots as uniform as possible with reference to breed, size, and general quality. They were fed alike as to pasture, hay, cabbage, and roots. Grain feeding began August 1 and continued to the latter part of November.

The results of these feeding operations are summarized as follows: "The wethers fed peas, oats, and bran were awarded first place in the carcass competition between the various lots each of the 3 years of the second period, and were also awarded the largest number of individual prizes at the show. Though peas were comparatively expensive, they produced firm flesh of high quality and also made good gains. They are therefore highly recommended for show fitting when fed in combination with oats and bran. Barley, oats, and bran ranked second in the carcass competition between the lots, and also in number of individual prizes awarded in the open classes. Barley and oats stood third in point of prizes won at the show and also ranked third in the carcass competition. This ration produced the lowest gains of any fed during the second period. Corn, oats, and bran, and corn and oats produced the largest and most economical gains, but, with a few exceptions, the wethers fed this ration were inclined to be soft and overdone. Carcasses from the lot fed corn, oats, and bran were never awarded prizes in the regular carcass classes. Whole oats fed alone are a most excellent feed for sheep which are well advanced in flesh, but as a rule, for sheep being fitted for fat classes, they are too bulky to insure the desired finish."

A former reference has been made to results obtained during the first 3-year period (E. S. R., 18, p. 263).

**Cassava for pigs.** J. L. FRATEUR and A. MOLHANT (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 87-118, fig. 1*).—Four pigs 2½ years old each fed a daily ration of 2.02 kg. of cassava, 2.02 kg. of a mixture of bran and low-grade flour, 1.6 kg. of mangels, and 0.18 kg. of meat meal for 77 days made a daily gain per head of 0.53 kg. (1.17 lbs.). In another test 5 pigs each fed a daily ration of 1.47 kg. of cassava, 1.47 kg. of the bran-flour mixture and 4.99 kg. of skim milk for 58 days, made a daily gain per head of 0.67 kg., and a similar lot 0.62 kg. per head. Methods and results of analyses of cassava by J. Van Buggenbont et al. are given.

**Trials with weights of fattening swine and the "plucks" from these.** E. HOLM (*Ber. K. Vet. og Landbohøjskolen Lab. Landøkonom. Forsøg [Copenhagen], 82 (1913), pp. 32, figs. 2*).—The average slaughter weight of 400 swine at 3 Danish slaughter houses was 70.8 kg. (warm) and 69.3 kg. (cold), and of the plucks (internal organs and offal) 4 kg. (warm) and 3.9 kg. (cold).

**Treatise on zootechny.**—II, The horse, P. DECHAMBRE (*Traité de Zootechnie*,—II, *Les Equidés*, Paris, 1912, pp. 494, figs. 68).—The first part of this book treats of the zoological classification, body conformation, measurements, and race characteristics of domestic animals. The author draws attention to the fact that races or breeds are characterized by their rectilinear outlines, especially the facial profile; that variations in morphology are noted in the cephalic and body form and in the external features, such as weight, color, horns, hair, wool, or plumage; and that in general there is a harmony or coordination of parts.

In the second part he takes up a study of the breeds of horses, classifying them under 3 groups, viz, those with a flat frontal or profile, those of concave frontal, and those of convex profile. These groups are further subdivided and classified. There follows a discussion of the origin, development, breed characteristics, distribution, and utility value of the different breeds of horses. The breeds included in this study are those of Arabia and Asia, Russia and Finland, Bohemia and Tunis, the Percheron, the Clydesdale, the ponies of England and Europe, the Belgian, the Shire, the Suffolk, and a number of the rare breeds of Asia and Europe. There is also given a discussion of the "demi-sang" or grades of England and France, among which are included the army remounts, the hunters, hackneys, and cobs, the Cleveland Bay, and the Irish half-breed.

The author also discusses the various breeds and types of mules and asses, both in Europe and in Asia, and discusses their production from the utility standpoint. There are included several chapters on the feeding, care, and management of breeding stock; and a discussion of the problems connected with the improvement of the military remount service and the government stud.

**Did the horse exist in America at the time of the discovery of the New Continent?** E. THOMASSARR (*Rev. Gén. Sci., 24 (1913), No. 19, pp. 725-729*).—In answer to this query the author offers as proofs of the early existence of the American horse (1) the records of history dating back to the Spanish conquest of Mexico, at which time native horses were discovered here; (2) evidences from geology and paleontology which point to a very primitive type of horse; and (3) the physiography of the country and the character of American animals, which indicate that America's close proximity to Asia facilitated the introduction of the horse from that continent.

**The feeding of farm horses** (*Dept. Agr. N. S. Wales, Farmers' Bul. 64, pp. 26*).—The first portion of this publication contains general information or "base feeding," condensed from Henry's Feeds and Feeding and other sources of the same nature. The following are then given from the principal of the Hawkesbury Agricultural Col

free and the managers of experiment farms throughout the State, describing the methods of horse feeding in use at these stations. The information given is of an entirely practical nature, outlining the rations fed and the methods of care and management, including notes on the treatment of horses for colic.

**Horse feeding experiments with dried beer yeast.** O. VON ZAWRZ (Ztschr. Landw. Versuchs., Österr., 16 (1913), No. 9, pp. 879-889).—This product proved to be a palatable laxative feed, and especially adaptable as a supplement to oat feeding.

**Cotton-seed meal as a feed for laying hens.** J. K. MONROSE (Mississippi Sta. Bul. 162, pp. 11, figs. 5).—This bulletin is a preliminary report of experiments in progress. Results of 6 months' work tend to show "that cotton-seed meal used as the chief source of protein is palatable to fowls, and that when fed judiciously on it they will produce eggs; that hens fed on cotton-seed meal will produce eggs when eggs are highest in price; that as far as can be determined the general condition of the cotton-seed meal-fed fowls seems just as good as the condition of those fed on beef scrap; that the tendency was to lose flesh and not get overfat, although the fowls were allowed access to the feed at all times; and that there is a good margin of profit from hens when given a properly balanced ration."

**Poultry notes, 1911-1913.** R. PEARL (Maine Sta. Bul. 216, pp. 141-168, figs. 8).—This bulletin includes a general consideration of the following items: The value, method of preservation, and economical use of hen manure; plans for the construction of a concrete manure shed costing approximately \$185; the value and method of construction of a crematory for dead poultry; the making of an improved range feed trough; methods for the protection of poultry against hawks, crows, rats, and other natural enemies; and the value and method of providing green feed for poultry.

The results of technical studies relating to the formation of the egg and previously reported from another source (U. S. R., 26, p. 670) are given.

**Mardi Gras poultry in France.** E. BROWN (Country Gent., 78 (1913), No. 42, pp. 1543, 1544, figs. 3).—The author describes the preparation of fancy poultry for the Mardi Gras festival of France. The Bresse fowl stands in highest favor, being a light-boned bird with excellent fattening qualities and of a delicate flavor. La Flèche is a larger and somewhat heavier bodied breed, but carries abundant meat, which is of a fine texture. Du Mans stands next in favor, being fine and white of skin, abundantly fleshed, and of excellent quality. The Crèveœur fowl is compact, broad, and deep, but lacking in quality. The Courtes Pattes fowl is a delervey, largely because of its quality, texture, and fine flavor.

**Breeders' and cockers' guide.** F. R. GROVER (Libby, N. Y., 1913, pp. 169, figs. 7).—This booklet treats of the breeding, feeding, care, and management of the breeds of poultry used for fighting and pit purposes.

**The national standard squab book.** E. C. RICE (Boston, 1913, 4, ed., pp. 416, figs. 200).—This is a practical manual giving complete directions for the installation and management of a squab plant.

## DAIRY FARMING—DAIRYING.

Some practical results of feeding experiments, J. R. LINDSEY (Massachusetts Sta. Rpt. 1912, pt. 2, pp. 56-64).—Dairy cows were fed a ration of hay, bran, gluten feed, and raw potatoes, the latter being fed in increasing amounts of from 10 to 50 lbs. per day. The addition of potatoes in 2 out of 3 cases not only checked the natural shrinkage in milk yield but actually increased the flow. It is concluded from these experiments that when potatoes are cut and fed in amounts up to 25 lbs. per head daily they in no way affect the

health of the animal or the yield of the milk. Foreign observations on the feeding of potatoes to steers, oxen, milch cows, dry cows, sheep, and horses are referred to.

The use of molasses and molasses feeds for farm stocks is also discussed.

**The food value of plain and molasses beet pulp,** J. B. LINSLEY (*Massachusetts Sta. Rpt., 1912, pls. 1, pp. 129-159; 2, pp. 64-66*).—Six cows were fed by the reversal method in periods lasting 5 weeks on a basal ration of hay, bran and cotton-seed meal to which was added 4.3 lbs. of either corn meal or of beet pulp daily.

The herd lost in live weight 32 lbs. on the corn meal ration and gained 37 lbs. on the beet pulp ration. There was no substantial variation in the yield or average composition of the milk. It required for the corn meal ration 112 lbs. dry matter to produce 100 lbs. of milk, and 20.51 lbs. to produce 1 lb. of milk fat; for the beet pulp ration 119.72 lbs. and 20.54 lbs., respectively.

In a similar experiment to the above molasses beet pulp and corn meal were compared. The amounts of digestible nutrients in each ration were approximately the same. The herd gains were similar. There was no wide variation in milk yields and only a slight advantage in the production of milk fat with the corn meal ration. It required for the corn meal ration 104.4 lbs. dry matter to produce 100 lbs. of milk and 18.72 lbs. to produce 1 lb. of fat; for the molasses beet pulp ration 108.1 and 19.87 lbs., respectively.

**The value of oats for milk production,** J. B. LINSLEY (*Massachusetts Sta. Rpt., 1912, pls. 1, pp. 141-153; 2, pp. 52-55*).—Three experiments were conducted in which 2 lots of 2 cows each were fed for alternate periods of 4 weeks each, with 1 week between periods, on like amounts of a basal ration of hay and bran to which was added a like amount of either corn meal or ground oats.

The average gain made in live weight with both systems was practically the same, and the yields of milk and of milk ingredients were nearly identical. However, it is believed that the allowance of the basal ration was too large, thus furnishing an excess of nourishment and tending to invalidate the results of the experiment.

The feed cost of milk and of milk fat was for the corn meal ration \$1.40 per 100 lbs. of milk and 21.5 cts. per pound of fat; and the oat ration \$1.48 per 100 lbs. of milk and 25.6 cts. per pound of fat. "While oats are a valuable food, it is not believed they can usually be fed economically to dairy animals in Massachusetts."

**Feeding experiments with milch cows,** A. CARLIER (*Min. Agr. et Trac. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 39-59*).—This gives detailed data concerning 2 experiments conducted in 1912 and a summary of 4 years' experiments in which comparisons were made of the feeding value of cotton-seed meal and coconut meal. On the whole, it was found that cotton-seed meal was more advantageous from the standpoint of milk production but that coconut meal apparently produced a slightly richer milk and more butter.

**Niger cake for milch cows,** E. WARSACK (*Min. Agr. et Trac. Pub. [Belgium], Off. Rural Raps. et Communs., 1913, No. 5, pp. 51-54*).—On a ration of hay, straw, mangels, bran, and wheat 2 cows for 5 days before and 10 days after an experimental period of 30 days gave a daily average per cow of 8.17 liters (about 8.6 qt.) of milk testing 2.59 per cent of fat. During the 30-day period in which the above ration was supplemented with from 1 to 2 kg. of niger cake the average milk production was 8.5 liters testing 3.08 per cent fat. The cows gained 13 kg. and 36 kg., respectively, in weight during the 30 days. An analysis of the niger cake is given.

Feeding experiments with hay and varying amounts of protein feeds for the dairy cow. J. J. ORT DE VRIES (*Verslag Ver. Exploit. Productieboerderij Noorn, 1912, pp. 15-37*).—In these experiments the protein-rich feeds proved more expensive without yielding an appreciable increase of milk over the protein-poor feed, and resulted in a lower milk fat percentage.

North Carolina dairy herd records. W. H. EATON (*Bul. A. C. Dept. Agr., 74 (1913), No. 5, pp. 39, figs. 51*).—Yearly tests of 14 North Carolina dairy herds, comprising in all 144 cows, are reported.

Comparing the economy of production as between large and moderate producers, it was found that the cows averaging 371 lbs. of milk fat per annum gave annual profits of \$68.71 per cow, and produced milk fat at a cost of 17 cts. per pound, while cows averaging 165 lbs. of milk fat gave profits of \$39.85, and the milk fat cost 25 cts. per pound.

Report of the Richmond-Lewiston Cow Testing Association, W. E. CAMPBELL (*Utah Sta. Bul. 127, pp. 194-242, figs. 81*).—During a 2 years' test involving 26 herds, the average yearly milk yield of the highest herd was 9985 lbs., and the lowest 4516 lbs.; the corresponding average yields of milk fat were 2391 and 197 lbs. During this period the average cost of feed for the highest producing herd was \$11.19 per year; for the lowest \$31.21, while the profit realized from the former was \$32.30, and the latter \$33.61. A wide variation was found in the yield of milk fat and net returns between cows in the same herd. The difference in milk-fat between the most and least profitable cow in each herd ranged from 40.07 to 324.7 lbs.

In studying the effect of length of lactation period upon total milk fat yield it was found that beginning with a dry period of 2 months the yield gradually decreased from 272.7 to 121.7 lbs., when the cows were dry 6 months or over during the year. No correlation was noted between the amount of fat produced the first month and the annual record. Dairy-bred cows led the scrubs in yearly production and in amount of fat given the first month of lactation and showed a decided tendency toward a longer lactation period. The data indicated that a cow for highest production should be dry longer than one month, but that a rest longer than 2 months adds nothing to her powers of production. Lactation periods of various lengths from 7 to 18.5 months, provided they are preceded and followed by normal dry periods in all cases, seemed to yield the same fat and profit in any given length of time.

Cows freshening in the fall produced on the average 45.1 lbs. more fat and returned \$9.43 more profit above cost of feed during the next 12 months than cows freshening in the spring. The cost of feed was \$5.33 more per head for the cows calving in the fall.

The highest producers were the most profitable. There was a uniform decrease in net returns with a decreasing milk-fat production.

Dairy industry in northern Europe, G. GILTONNEAU (*Ann. Inst. Nat. Agron., 2, ser., 12 (1913), No. 1, pp. 41-178, figs. 451*).—Part 1 of this report gives the results of a study of the dairy industry in north Germany, Denmark, the Netherlands, and Sweden. In a study of the milk supply of large cities the author deals especially with Copenhagen and Stockholm. In a chapter on the manufacture of butter and cheese descriptions are given of a number of creameries and of the newer forms of creamery equipment and machinery. Notes are also given on the manufacture of casein, milk sugar, and powdered milk.

Part 2 deals with the organization of the export trade in milk products in the Netherlands, Denmark, and Sweden.

Report of the sanitary inspector of the State of Idaho, 1911-12, J. H. WALLIS (*Bien. Rpt. Idaho Dairy, Food and Sanit. Insp. and State Chem., 5*

(1911-12), pp. 19-32, 129-153, pls. 4).—This is a report on the analysis and condition of samples of commercial butter, cream, milk, ice cream, and condensed milk. There is also included a statistical report on the number of cows milked, the average yield, grade of stock, stock water supply, and the scoring of a number of Idaho dairy farms.

**Report of the feed and dairy section, P. H. SMITH** (*Massachusetts Sta. Rpt., 1912, pt. 1, pp. 118-128*).—This includes the text of an act to regulate the use of utensils for testing the composition or value of milk and cream; also a summary of inspection work with glassware, etc.

**The ductal system of the milk glands of the bovine, O. WIEZ** (*Arch. Wiss. u. Prakt. Tierheilk., 39 (1913), No. 4-5, pp. 375-421, figs. 7*).—This is an elaborate treatise on the anatomy of the milk glands and the nature of milk secretion in the bovine, dealing with the constitution and function of the alveoli, the relation of milk secretion and the blood streams, the ductal system and its functions, the occurrence of leucocytes, the consistency of the udder, and the size and nature of the milk cistern. A bibliography of 25 references is appended.

**Factors affecting the composition of milk, J. AUBOUSSEAU and L. J. PONSCHAMPE** (*Bull. Ecole Nat. Agr. Grignon, 3 (1912), pp. 73-106*).—This is a series of papers on the composition of milk from the standpoint of milk inspection, as follows:

*Influence of feeding stuffs on the composition of milk* (pp. 73-81). Two cows on pasture supplemented with hay, bran, mangels, and linseed cake, with straw ad libitum, for 5 days gave a daily average of 15 liters (about 15.9 qt.) of milk each, containing 4.43 per cent milk fat and 9.03 per cent solids-not-fat. The supplemental feeds were then withheld and the cows had the run of pasture with straw ad libitum for 6 days, during which their average milk production was 18.6 liters each, containing 3.33 per cent fat and 8.74 per cent solids-not-fat. These results were confirmed in a test with 4 cows the following year. In another test with 4 cows for 3 days on a ration of dry fodders, bran, and sweet pasture, the average daily milk yield per cow was 10.37 kg. with an average composition of 4.02 per cent milk fat and (the first and third days only) 9.13 per cent solids-not-fat. These cows were then fed a ration of turnips with oat straw ad libitum for 6 days, during which their average milk production was 12.25 kg. each with an average composition of 3.5 per cent milk fat and 8.77 per cent solids-not-fat.

*Composition of first and last drawn milk* (pp. 87-90). Analyses are reported of the first and last portions of milk drawn into separate receptacles. Of the first half of 2 milkings the fat content was 1.51 per cent, the solids-not-fat 9.45 per cent. The corresponding percentages for the last half of the 2 milkings were 4.86 and 9.04.

*Influence of spontaneous creaming on the composition of milk* (pp. 91-96). In a test with 5 liters of fresh milk testing 3.9 per cent fat and 9.08 per cent solids-not-fat, a sample of 1 liter poured off at the end of 1½ hours tested 4.5 per cent fat and 8.78 per cent solids-not-fat. A second liter poured off at the end of 2½ hours tested 3.8 per cent fat and 9.19 per cent solids-not-fat. Two liters poured off at the end of 3½ hours tested 4.35 per cent fat and 8.87 per cent solids-not-fat. The remaining milk tested 2.5 per cent fat and 9.65 per cent solids-not-fat. In another test the milk remaining after the withdrawal of the third sample tested 2.2 per cent less fat than the original milk. This milk, after being subjected to these 2 tests, was heated to 30° C. and the test repeated. After the withdrawal of the third sample the remaining milk tested only 0.4 per cent less in fat than the original milk.

*Influence of potassium bromid on the composition of milk* (pp. 97-106). Doses of 20, 25, and 30 gm. of potassium bromid fed to cows had no appreciable

effect on the quantity or fat content of the milk. The bromid was found in the milk 14 hours after ingestion and for more than 2 days after the last dose. In another test with 2 cows the ingestion of 60 gm. of potassium bromid was followed by diminished milk production and a reduction of fat content. This reaction was rapid, in no case persisting for more than 36 hours after the dose. After the effects of the bromid had passed off the fat content of the milk rose rapidly above the normal, indicating that potassium bromid has a restraining effect on fat secretion. Complete analyses are given of these milks before and after the ingestion of bromid.

**The viscosity of cream,** F. K. M. DUMARESQ (*Proc. Roy. Soc. Victoria*, n. ser., 25 (1913), No. 2, pp. 307-322, figs. 5).—Results of experiments testing the viscosity of cream under different conditions are summarized as follows:

"(1) The main factors instrumental in varying the viscosity of cream are acidity, temperature, and fat content, and of these three the first holds the most important place. (2) An increase in acidity produces very little effect on viscosity of cream, up to the 'critical point,' at which a sudden sharp rise in viscosity occurs. (3) The change in viscosity of separated milk at the degree of acidity corresponding to the 'critical acidity' of cream is very slight, i. e., for separated milk there is no critical acidity, proving that this is a property of the fat globule, or rather of its envelope. (4) An increase in temperature of cream diminishes its viscosity, at first rapidly, afterwards at a slower rate. (5) The viscosity of cream is a quadratic function of the fat content, if the other factors remain constant."

**On the influence of different factory methods on the water content of the curd of Edam cheese,** W. VAN DAM (*Verslag Ver. Exploit. Proefzuivelboerderij Hoorn*, 1912, pp. 84-91).—In these tests the moisture content ranged from 40.8 to 52 per cent. Poorly coagulated curd tested higher than normal curd. The addition of calcium chloride increased the moisture content, whereas longer standing reduced it. Working the curd at a high temperature, 23° C. (90.8° F.), resulted in a higher moisture test than working at 20°. A low heating temperature, 33.5°, was also conducive to a higher moisture test.

**On the faulty "Knijpers" in Edam cheese,** F. W. J. ROEKHOFF (*Verslag Ver. Exploit. Proefzuivelboerderij Hoorn*, 1912, pp. 92-102).—The diseased condition sometimes found in Edam cheese affected with cracks or faulty formation is known as "Knijpers." The cracks or rents occur as the result of the formation of gases due to a bacterium which has been isolated. As a preventive for the occurrence of this gas the addition to the cheese of a small quantity of potassium nitrate is suggested.

**Wensleydale cheese,** MISS G. N. DAVIES (*Jour. Agr. [New Zealand]*, 7 (1913), No. 2, pp. 147-149).—Directions are given for the manufacture of Wensleydale cheese, which is described as a very mellow, rich, finely flavored, and blue molded cheese, resembling the Stilton variety.

**Some investigations of parchment paper,** S. HALL and S. HROGSHAGEN (*Norsk Landmandsblad*, 32 (1913), No. 31, pp. 369-371).—The results of chemical and physical examinations of a dozen samples of parchment paper used for dairy purposes are given and discussed. The determinations included color, smoothness of surface, weight per square meter, ash in paper and in water-soluble substances, total water-soluble substances, sugar, boric acid, magnesium chloride, and moisture. Seven of the samples contained from 14.2 to 26 per cent of water-soluble substances, and 4 contained from 13.2 to 14.5 per cent of reducing sugars.



## VETERINARY MEDICINE.

**Report of the civil veterinary department, Eastern Bengal and Assam, for the year 1910-11, W. HARRIS (Rpt. Civ. Vet. Dept. East. Bengal and Assam, 1910-11, pp. 2+28+21).—**This report includes an account of the occurrence of the more important diseases of animals, preventive inoculations, breeding operations, etc.

**Report of the civil veterinary department, Assam, for the year 1912-13, S. G. M. Hickey (Rpt. Civ. Vet. Dept. Assam, 1912-13, pp. 3+23+1).—**A report similar to the above.

**The diagnosis of newly lactating animals according to Schern's method, E. WILDER (Ztschr. Tiermed., 17 (1913), No. 5, pp. 295-299).—**Following studies of Schern's method (E. S. R., 21, p. 611) the author states that if an initial milk decolorizes the formaldehyde methylene blue solution (Scharlanger's reagent) within 10 to 12 minutes, it may be concluded that it comes from an animal in an advanced state of lactation. If the reagent is not decolorized, however, or if the milk contains strippings, no conclusion can be drawn.

**The use of pituitary extract in bovine and equine obstetrics, H. SCHMIDT and M. KOPP (Abh. in Vet. Rev., 26 (1913), No. 1316, pp. 199, 200).—**This is a report of six cases in which very satisfactory results were obtained.

**Serum-therapy in practice, A. R. McNARY (Amer. Vet. Rev., 43 (1913), No. 3, pp. 284-286).—**This details the author's experiences in tuberculin testing and with antistrangles vaccine, canine distemper bacterin, blackleg vaccine, polyvalent bacterins, and hog cholera vaccine.

**Natural variation of *Bacillus acidilactici* with respect to the production of gas from carbohydrates, J. A. ACKWORTH (Jour. Hyg. [Cambridge], 13 (1913), No. 1, pp. 68-86).—**"A bacillus belonging to the *B. acidilactici* group has been repeatedly isolated during 11 months from the urine of one patient, and no other Gram-negative bacillus has been found in the same urine during this period. The bacillus has occurred in 2 varieties which differed as regards gas formation only. Variety I formed gas from sugars and alcohols, and Variety II formed acid and no gas from the same sugars and alcohols. The 2 varieties gave identical serum reactions, both as regards agglutination and absorption of agglutinins with specific sera prepared from rabbits immunized with the respective varieties. Intermediate varieties as regards gas production also occurred, but were not constant when subcultured. Varieties I and II remained constant in their characters after 4 months' subculture on broth and agar. Variety II, which at first did not produce gas from sugars, was induced to do so by first growing in a solution of sodium formate in broth."

**The action of the protein poison on dogs: A study in anaphylaxis, C. W. EDWARDS (Ztschr. Immunitätsf. u. Expt. Ther., 1, Orig., 17 (1913), No. 2, pp. 165-184, figs. 4).—**This article indicates that the symptoms produced by the injection of the poisonous portion of the protein molecule are practically the same as those which are noted in acute anaphylaxis, with the exception that in the last-named case the blood loses its coagulating power.

**About the specificity and the diagnostic value of the Ascoli thermo-precipitin reaction for detecting hematic carbuncle and erysipelas, G. PANZA (Centbl. Bakt. [etc.], 1. Abt., Orig., 68 (1913), No. 5-6, pp. 556-562).—**The author concludes that the thermo-precipitin reaction has no specific value for the diagnosis of either hematic carbuncle (anthrax) or erysipelas. Extracts of the organs of animals affected with carbuncle give a zonal reaction with a specific erysipelas serum, and derivatives of the *Bacillus anthracis* and the products of the Preisz-Nocard bacillus also show a specific reaction. Sera from sound horses, heated from 6 to 12 to 48 hours at from 55 to 56° C.

react with the organ extracts from animals affected with anthrax, as do also normal sera of bozines, rabbits, and guinea pigs. Egg white behaves toward the derivatives in the same way.

A specific reaction can be obtained with extracts of the epiploon, heart, liver, or spleen of guinea pigs affected with carbunculos. The extracts of the epiploon were more active than those of the spleen.

**Thermoprecipitation in anthrax.** Z. SZYMANOWSKI and J. ZAGADA (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 12 (1912), No. 3, pp. 256-265; *abs.* in *Ztschr. Immunitätsf. u. Expt. Ther.*, 11, *Ref.*, 6 (1913), No. 8, p. 7191).—A group of animals is described in which 69 were suspected of having anthrax. Of these, 33 gave a positive and 22 a negative precipitin test. These findings were verified by the bacteriological examination. In 11 cases the thermoprecipitin reaction showed positive when the bacteriological test showed negative, but in only 3 cases did the thermoprecipitin test show negative when positive results were found bacteriologically.

**Anthrax vaccination, its use and abuse.** J. A. GOODWIN (*Am. J. Vet. Res.*, 3 (1913), No. 3, pp. 267-275).—This discusses the reasons for failure in anthrax vaccination, the kinds of animals to vaccinate, points to be considered in immunizing animals, impotency of some vaccines, the advisability of hyperimmunizing animals, abuse of anthrax vaccination, and the promiscuous distribution of vaccines and other biological products by uneducated parties.

**Feeding experiments with the virus of infectious bulbar paralysis.** S. von RITZ (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 13 (1913), No. 1-2, pp. 1-7).—The experiments showed that the virus of this disease may be ingested by mice and *Canisvora* in infected food and the disease produced in this way. Five of 11 cats and dogs fed upon virulent material died.

**The relationship between the paratyphoid infections in man and in animals.** D. A. DE JONG (*Rev. Gén. Méd. Vét.*, 22 (1913), No. 257-258, pp. 117-123; *abs.* in *Jour. Compar. Path. and Ther.*, 26 (1913), No. 3, pp. 266-268).—The author concludes that "bacterial diseases of animals slaughtered for meat can only be considered as the cause of meat poisoning in very exceptional cases. The organisms in question occur in nature as saprophytes and are to some extent excreted by diseased or healthy men and animals (carriers). They can be found normally in healthy men and animals. In such cases they may be the cause of secondary infections. They can infect the carcasses or animal products of even healthy animals, but more particularly the carcasses and products of diseased animals, because these form a particularly favorable culture medium for the organisms."

**Some peculiar and probably specific bodies in the erythrocytes in rinderpest and another allied disease.** W. L. BRADON et al. (*Parasitology*, 4 (1913), No. 3, pp. 265-275, *pl.* 1).—The bodies here described have been invariably found by the author in all cases of typical acute rinderpest during the febrile stages and in the great majority of the cases for long periods up to 8 months after recovery has taken place.

"The occurrence of a body of special, and within certain limits, uniform morphology has been demonstrated in the red corpuscles of animals affected with rinderpest. The movements of the body, the evidence of its growth part *passu* with the development of the disease, and above all its reproduction in animals in which it was not previously present on the inoculation of material containing it, are evidence of its being a living and independent organism. Its detected presence (so far) only in animals which at the time have, or which probably have had, rinderpest recently, and its entire absence from animals highly susceptible to the disease, but known not to have had it or to have been exposed to infection, affords a presumption that the body is specifically related

to the disorder, or in other words represents a stage in the life history of the specific infective agent; or, it may be, a culture form . . . The specific body resembles no parasite of which the life history is so far known . . .

"The second body described affords evidence of the existence of a second specific complaint which may be and probably has been in the past confused with true rinderpest. It would be important to determine if animals affected by the second complaint when they have recovered are still susceptible to true rinderpest. The second body also is a new form."

About a supposed neutralization of the activity of tetanus toxin by neurin or betain, V. ABERSEN (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 17 (1913), No. 2, pp. 135-140).—Either neurin or betain hydrochlorid is capable of neutralizing tetanus toxin, but this is not due to any specific property of the two substances but rather to the inhibition of an acid or an alkali. If an acid or an alkali is added to tetanus toxin, no toxic results are produced.

On "tick paralysis" in sheep and man following bites of *Dermacentor venustus*, with notes on the biology of the tick, S. HADWEN (*Parasitology*, 6 (1913), No. 3, pp. 283-297, pls. 2).—"Tick paralysis" occurs in British Columbia and affects man, sheep, and probably other animals. The disease is caused by the bites of *D. venustus*. It is usually of short duration, is benign in character, but occasionally it persists for long periods, and may terminate fatally. From an economic point of view the disease is of some importance in the sheep industry. The causative agent has not been discovered, and the disease has not been reproduced by inoculation. The most likely hypothesis is that the tick injects a toxin which gives rise to symptoms appearing coincidentally with the complete engorgement of the tick. In three consecutive cases, experimentally produced by me in lambs, paralysis occurred 6 to 7 days after the ticks were put on. In no case did I fail to produce paralysis through the agency of the tick bites. It has been proved that *D. venustus* usually bites sheep along the backbone; possibly the point of attachment may have some bearing on the symptoms or severity of the case."

Experimental "tick paralysis" in the dog, S. HADWEN and G. H. F. NUTTALL (*Parasitology*, 6 (1913), No. 3, pp. 298-301).—"This is a report of experiments in which "tick paralysis" was experimentally produced in a dog at Cambridge through the application of a single *Dermacentor venustus* female from Canada. The disease is said to be the same as that observed in sheep and described in the paper above noted. The examination of the dog's blood proved negative.

The chemistry of tuberculin, G. LOCKEMANN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 73 (1911), No. 5, pp. 389-397; *abs. in Centbl. Bakt.* [etc.], 1, Abt., Ref., 52 (1912), No. 1-2, pp. 37).—"If tubercle bacilli are grown in a medium containing asparagin as the only source of nitrogen, protein-like substances are developed in the culture medium which are supposed to originate from the tubercle bacillus; consequently the author believes that the metabolic products elaborated by the tubercle bacillus are somewhat dependent upon the make-up of the medium in which they are cultivated.

Contribution to the chemistry of the tubercle bacillus.—A preliminary report, E. LÖWENSTEIN (*Centbl. Bakt.* [etc.], 1, Abt., Orig., 68 (1913), No. 7, pp. 591-593).—"As an initial step in determining whether the composition of tuberculin was dependent upon the nutrient solution used for cultivating the tubercle bacillus, an attempt was made to find a simpler nutrient solution than has heretofore been used for preparing tuberculin. A nutrient solution composed of ammonium phosphate, glycerin, and distilled water was prepared and inoculated with the tubercle bacillus. Some controls received an addition of 0.4 per cent of either sodium chlorid, potassium chlorid, or potassium sulphate

The greatest growth was noted in the ammonium phosphate flask. The flask containing the sodium chlorid in addition showed a lesser growth, but it was greater than the flask containing potassium chlorid; consequently the presence of potassium, sodium, chlorine, or sulphur is deemed unnecessary for the growth of the tubercle bacillus. The synthetic tuberculin so obtained was found to be as active as that prepared in an asparagin medium.

Experiments in regard to the inhalation of tuberculous material from man by the cat, P. CHARSSÉ (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 2, pp. 50-52; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 52 (1912), No. 15, p. 126).—The inhalation tests, which are a continuation of those previously reported (E. S. R., 20, p. 179; 29, p. 178), were conducted in a small specially constructed chamber, with cats of various ages kept side by side with guinea pigs and dogs. Out of 14 cats only 4 became infected. The tubercular changes produced were in most instances only slight but in others quite extensive. According to this there seems to be a great difference in regard to the receptivity of cats to this disease.

Two cases of spontaneous tuberculosis in the rabbit caused by the avian tubercle bacillus, L. COMBET (*Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 33-43, figs. 4).—"As tuberculosi caused by one or the other type of mammalian tubercle bacilli is not confined entirely to mammals, but may occur in the parrot, the raven (Rabinowitsch), and probably also in the canary and sparrow, so tuberculosi caused by the avian tubercle bacillus is not limited to birds, but may sometimes be found in the pig, the mouse, and perhaps in man and the ape also."

In this paper two cases of natural infection of rabbits, which were kept in the same yard with a number of guinea pigs and tubercular fowls, are described. Cultural investigations and the results of autopsies are included.

Subcutaneous tuberculosis in bovines, C. FÉRY and G. RAMON (*Bull. Soc. Prat. Méd. Vét.*, 99 (1913), No. 8, pp. 167-171).—"Under the name 'subcutaneous tuberculosis' the authors designate not only the disease caused by hypodermic injections but also the condition which is produced by the process of extension whereby the organisms enter the superficial fibers of the muscles. The lesions in this area were found to differ markedly in their microscopic aspects from those usually noted in classical tuberculosis. They resemble somewhat the metastases which occur in cancer, and those in sporotrichoses or blastomycoses. The diagnosis on the cadaver is rather difficult.

The findings with some cases of this variety of tuberculosis are given.

Investigations in regard to the specific action of tuberculosis serum by mixing tuberculin and tuberculosis serum, A. SARA (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 17 (1913), No. 1, pp. 84-98, pl. 11).—By simply mixing old tuberculin or powdered tubercle bacilli with tuberculosis serum under certain quantitative and other conditions and at a temperature of 38° C., it is possible to produce a poison *in vitro* which, with sound guinea pigs, will give the characteristic tuberculin reactions. The reactions so produced are characterized by a rise in temperature, resulting in the classical anaphylactic death.

By keeping the toxin for several days in the incubator, its toxicity is destroyed, and consequently it will not be lethal for guinea pigs and will not yield the typical reactions on injection. In this case there probably occurs the action of the toxic substance, which is supposed to go on in two phases.

Passive transference of tuberculin sensitiveness by tuberculosis serum, and the valuation of the serum by this method, A. SARA (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 17 (1913), No. 1, pp. 62-75, figs. 5).—It is possible to produce a hypersensitiveness in guinea pigs by treating them with tuberculosis serum. The passive immunity so produced is not only character-

lized by a typical rise in temperature when injecting tuberculin, but it is also possible to produce lethal results by the injection of the tuberculin. This process affords a measure of the activity of the tuberculosis serum.

Investigations in regard to the specific action of tuberculosis serum with anaphylatoxin tests, A. SARA (*Ztschr. Immunitätsf. u. Expt. Ther.*, 1, Orig., 17 (1913), No. 1, pp. 75-83).—Anaphylatoxin (used in Friedberger's sense) can be prepared from tubercle bacilli either by treatment with complement or by pretreatment with normal horse serum or immune serum. A further cleavage of anaphylatoxin into lower nontoxic products can be made if the conditions of the experiments are modified.

In regard to the value of the urochromogen reaction as an indicator for tuberculin treatment, M. WEISZ (*Wiener Klin. Wochenschr.*, 25 (1912), No. 28, p. 1654; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, 11, Ref., 6 (1912), No. 2, p. 118).—The detection of urochromogen in urine with Ehrlich's diazo reaction or with Weisz' permanganate reaction leads to the conclusion that the disease is in progress. In this stage treatment with tuberculin is useless and in fact its use is contraindicated.

About the use of the precipitation method for diagnosing contagious abortion, S. SZYMANSKI (*Arch. K. Gendtsamt.*, 43 (1912), No. 1, pp. 145-154).—It is shown that with a phenol-sodium chlorid extract of abortion bacilli immune sera of high potency can be prepared. The sera from naturally infected animals seem to give variable results, some giving weak reactions and others no reaction at all.

In a series of tests with sera from a number of bovines which were apparently sound, a precipitation was obtained with the phenol-sodium chlorid precipitant; consequently the precipitation test conducted with this reagent can not be relied upon.

Infectious abortion in cattle, and its control by means of vaccination. O. SCHREIBER (*Deut. Tierärztl. Wochenschr.*, 21 (1913), No. 3, pp. 33-35; *abs. in Jour. Compar. Path. and Ther.*, 26 (1913), No. 1, pp. 53, 55).—This is a complete report of the work previously noted (E. S. R., 28, p. 350). Forty-three of 54 fetuses examined came from 19 farms where abortion was administered to the animals, and in most of the fetuses bacteria in addition to the *Bacillus abortus* were noted.

Methylene blue, a remedy for infectious abortion, F. A. RICH (*Vermont Sta. Bul.*, 17, pp. 315-323).—This is a preliminary report of investigations by the author extending over a period of 15 years in the course of which various preventive and remedial agents were tested. In its action on *Bacillus abortus* the author found methylene blue (medicinal grade) to be from twenty to fifty times more effective than carbolic acid. It has proved almost uniformly successful, is readily administered, and is apparently free from danger to man or beast.

In laboratory tests of the effect of methylene blue on the abortion bacillus no growth resulted where methylene blue was used at strengths of 1:1,000 for 1 to 3 minutes; 1:2,000 for 1 to 5 minutes; 1:4,000 for 4 to 8 minutes; 1:5,000 for 30 minutes; 1:6,000 for 1 hour; 1:8,000 for 2 hours; and 1:10,000 for 3 hours.

In his experiments the author made use of 4 herds. Of 30 cows in the first herd, all of which reacted to both the agglutination and the complement fixation tests, one-half received 1 oz. of methylene blue daily on grain or sludge for a period of 30 days, while to the other half it was administered in gelatin capsule for a period of 6 or 7 days, the dosage being repeated after a period of 4 weeks. In one animal the disease appeared to have progressed too far for favorable issue as abortion took place on the second day of the treatment. At the time of writing 14 of the treated cows had calved at full term and the remaining 1

were still under treatment and observation. In the second herd each of 31 animals reacting to the agglutination test was given 1-2 oz. of methylene blue in feed daily for 30 consecutive days and all calved normally. In the third herd 22 cows which reacted to the agglutination test received 10 gm. of methylene blue in silage night and morning for 6 consecutive days and after 4 weeks' interval the treatment was repeated, the methylene blue being given in gelatin capsules. At the time of writing none of the 24 animals treated had aborted, and 8 had calved normally at full term. In the fourth herd 9 animals, all but one of which gave positive agglutination tests up to 1:640, were given  $\frac{1}{2}$  oz. of methylene blue in gelatin capsules once a day for 6 days, followed by an interval of 4 weeks, as in herd No. 3. At the time of writing 3 of the 9 cows had calved at full term and no case of abortion had occurred in the herd since the beginning of the treatment.

**Generalized mycosis in the bovine.** P. LANGRAND (*Hgg. Viande et Lait*, 7 (1913), No. 9, pp. 425-433, figs. 4; *abs.* in *Vet. Rec.*, 26 (1913), No. 1319, pp. 276, 277).—The author reports upon a case of this disease in a cow, including post-mortem and microscopic findings.

**The keeping quality of antihog cholera serum.** S. RAYOK (*Chibarovski Iapok*, 35 (1912), No. 48, pp. 569, 570; *abs.* in *Berlin. Tierärztl. Wochenschr.*, 29 (1913), No. 13, p. 241).—Hutyra's serum was obtained 4 year after manufacture. In the cases where it was used, it had not only protective power but decided curative properties. Pigs having a temperature of 116° C., bloody feces, vomiting, and nosebleeds were cured by this serum.

**A disease (salmonellosis porcina) in pigs.** J. LAGSTEDS (*Ark. Zootek.*, 3 (1913), No. 45, pp. 593-511).—In Argentina there is a disease prevalent among pigs which resembles hog cholera somewhat, and attacks principally the younger animals. It is characterized especially by the production of necrotic lesions in the intestinal mucosa, in the vicinity of the Peyer's valve, and in the large intestines. Cessation is also noted in the mesentery. It is supposed to be caused by an ultramicroscopic organism.

Inoculation and cohabitation tests, with a discussion of the prophylaxis and serum-therapy, are included.

**An enzootic among young pigs caused by a variety of the *Streptococcus pyogenes*.** HUYVEL (*Dcut. Tierärztl. Wochenschr.*, 21 (1913), No. 12, p. 172; *abs.* in *Vet. Rec.*, 26 (1913), No. 1318, pp. 259, 261).—Numerous cases of sickness, which appeared among young pigs confined in exposed pens and resulted in a mortality of 50 per cent, were found to be due to a variety of *S. pyogenes*.

**Injury to fetlock with purulent infection—autotherapy.** J. MACDONALD (*Amer. Vet. Rev.*, 43 (1913), No. 3, p. 399).—A description of a case in a coaching horse from London, which was successfully treated by autotherapy.

**Fistulous withers, and synovitis of the coronary joint—autotherapy.** R. S. MACKELLER (*Amer. Vet. Rev.*, 43 (1913), No. 3, pp. 399, 391).—A description of cases successfully treated by the method.

**Contribution to the knowledge of virus carriers of influenza of the horse.** A. M. BREGMAN (*Ztschr. Infektionskrank. u. Hyg. Hanthier.*, 13 (1913), No. 3-5, pp. 161-174, figs. 4).—The author reports having found an apparently healthy stallion, 21 years old, which transmitted influenza to all of the mares covered during the last 6½ years of his life. The incubation period of the disease in these mares was from 4 to 6 days. No other changes than the catarrh of the mucous membrane of the seminal vesicles of this animal were detected. Three horses infected subcutaneously with the contents of the seminal vesicles became infected. This stallion is said to have always transmitted the typical catarrhal and never the pectoral form. Three horses that were subcutaneously infected with prostate secretion, the contents of the seminal vesicles, and of

the ampulla of the vas deferens, respectively, showed symptoms of influenza within 3 to 5 days thereafter. The fact that no micro-organisms of etiologic importance could be demonstrated therein microscopically or culturally leads the author to conclude that the virus is ultravisible. He considers catarrhal influenza (Rollausenche, influenza erysipelatosa) and pectoral influenza or contagious pleuropneumonia (Brustsenche) to be two independent diseases.

The etiology and therapy of typhoid fever or influenza in the horse (Pferdestaupe), E. BEHLMANN (*Centbl. Bakt. [etc.], 1. Abt., Orig.*, 68 (1913), No. 1, pp. 8-28, fig. 1).—Investigations extending over a period of 5 years lead the author to distinguish between catarrhal influenza or typhoid fever (Pferdestaupe) and contagious pleuro-pneumonia (Brustsenche) of the horse, which he considers to be two independent affections.

He concludes that the influenza (Pferdestaupe) virus is ultravisible, as reported by Bassel (*E. S. R.*, 28, p. 181), since the affection can be transmitted by the porcelain filter filtrate from blood obtained from horses naturally or artificially infected. The virus may remain virulent for a long time, even for 3 years, in the seminal vesicles of a healthy stallion which may infect mares at the time of service. Such mares act as a source of infection to other horses in the stable. The infection is not transmitted to any distance by intermediary carriers. The period of incubation in artificially infected animals is from 3 to 5 days. In blood kept at room temperature the virus loses its virulence in 3 months. The course of influenza is benign, save in colts and pregnant mares, and under normal conditions recovery takes place in from 10 to 12 days. The author considers it desirable that horses at remount stations be artificially infected with the influenza virus and that this be done as soon as possible after their arrival at the station.

Influenza among remounts and its treatment with salvarsan, JÄGER (*Ztschr. Veterinärk.*, 35 (1913), No. 7, pp. 289-299; *abs. in Vet. Jour.*, 69 (1913), No. 360, pp. 370, 371).—This paper is based upon studies of a large number of cases of the disease. The treatment with salvarsan consisted in the injection of 3 gm. dissolved in 150 cc. of a 0.9 salt solution into the jugular vein, one dose being sufficient.

The author finds that "salvarsan causes a quick decline of fever and a shortening of the whole fever period, a slow favorable influence on the activity of the heart, a hindering and retarding of the pneumonia, a beneficial effect on the appetite and general condition—loss of weight seldom occurred, a shortening of convalescence, no checking or avoidance of dreaded subsequent effects—tendonitis, pointing, etc., scarcely any arrest or stoppage of the source of infection, and scarcely any shortening of the duration of the illness."

A note upon strangles in the Philippine Islands, W. H. BOYXSON (*Philippine Jour. Sci., Sect. B*, 8 (1913), No. 3, pp. 237-249).—"From the results derived from the cultures and from microscopic examinations of the purulent discharges, it is evident that streptococcal infection exists in horses in the Philippine Islands.

"Since bouillon cultures had no effect on rabbits and guinea pigs when inoculated subcutaneously, and did have decided effect upon a horse, it proves conclusively that the organism isolated was *Streptococcus equi*. No white mice were on hand, so the virulence of the culture could not be tested on them."

"From the information gained through inquiry it is very evident that strangles is a widespread disease among horses in the islands, an interesting fact in view of the reputed rarity of streptococcal infections in man."

Protective substances of fowl cholera immune serum, E. WEIL (*Arch. Hyg.*, 76 (1912), No. 8, pp. 343-360; *abs. in Ztschr. Immunitätsf. u. Exptl. Ther.*, 11, Ref., 6 (1912), No. 12, p. 911).—The immunizing power of immune serum which

was first brought into contact with killed fowl cholera bacteria was lowered or entirely destroyed when injected into animals which received simultaneously intraperitoneal or subcutaneous injections of the bacteria. If the immunization is made 18 hours before the infection, the weakening effect is not noted. If the animal is infected peritoneally and immunized at the same time, but with a dose selected to kill after 18 to 20 instead of 12 hours, the immunizing power of the serum is not affected.

The rapid cure of polyneuritis gallinarum by intramuscular injection of a substance isolated from rice—note on the pathology of the disease, O. WELLMAN, A. C. ERSTIS, and L. C. SCORY (*Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1913), No. 4, pp. 295-299).—The investigations of which the preliminary report is here given were carried on along lines similar to those indicated by Funk (*E. S. R.*, 27, p. 598) and others.

Healthy chickens were fed on diets of polished rice, grits, and sago, and in the interval before the symptoms of polyneuritis should show themselves, intramuscular injections were made of extracts of rice polish prepared by the same method as that used by Funk, save that after concentrating "and neutralizing with NaOH, Ba(OH)<sub>2</sub> was added and the barium soaps together with the precipitated phytin filtered off. Barium was eliminated with carbon dioxide and sulphuric acid, following which came the precipitation with phosphotungstic acid, its decomposition with baryta, and concentration of the filtrate in vacuo at from 50 to 50° C."

The authors feel justified in drawing the following provisional conclusions from the investigations as thus far conducted: "The curative substance acts independently of the liver or alimentary tract, and it is readily absorbed from intramuscular injections. Degeneration of the nerves is confined principally to disturbance in the myelin sheath of the fibers. Neither the sensory nor motor tracts of the cord, medulla, or brain undergo any observable changes. There is a possibility that the cause of convulsions may lie in spinal irritation caused by subdural hematomas due probably to increased permeability of the vessel walls."

## RURAL ENGINEERING.

Irrigation branch (*Rev. Rpt. Bihar and Orissa [India], Irrig. Branch, 1911-12*, pp. 11+9+24+28+5+21).—The transactions of the Irrigation department of the Government of Bihar and Orissa for the year 1911-12 are given in so far as they relate to works of irrigation and navigation.

Irrigation of Santa Cruz Valley, M. C. HINDERLINGER (*Engin. Rec.*, 68 (1913), Nos. 8, pp. 200, 201, figs. 3; 9, pp. 242, 243, figs. 8).—This article describes a system for recovering underground water in Arizona by means of deep wells and pumping stations. Since the water-bearing formation underlying the impervious subformation beneath the valley is comparatively shallow it was necessary to develop unusual and novel features, the most important of which is a recovery system consisting of 19 wells drilled to depths ranging from 45 to 150 ft. in a straight line across the narrow part of the valley to intercept the underground waters, together with the necessary pumping equipment. These wells are connected by means of a gravity conduit of reinforced concrete 4,740 ft. in length, located and built from 5 to 12 ft. below the water plane of the valley.

The distributing system consists of a reinforced concrete pipe line 48 in. in diameter and 1,500 ft. in length, forming the outlet from the recovery system; a 48 in. concrete siphon under the Santa Cruz River, about 7 miles of earth canal, some of which is lined with concrete; and 21 miles of laterals.

Pressure pipes for the conveyance of water and for inverted siphons, B. A. ETCHERREBY (*Jour. Electricity*, 30 (1913), Nos. 21, pp. 474, 475, figs. 2; 22,



pp. 494, 495, figs. 4).—The mathematical analyses given of the design of steel and wooden stave pressure pipes include the derivation of formulas for thickness of steel pipe, size and spacing of bands, and size of staves for wooden stave pipe. Wooden stave pipe are claimed to be cheaper than steel pipe, not subject to corrosion, to have a greater carrying capacity than a riveted steel pipe of the same diameter, if kept saturated to be of probably greater durability, and to be unaffected by heat or cold. Its disadvantages are that it must be kept saturated continuously and is liable to destruction by fire.

Methods of constructing reinforced concrete pressure pipe are described.

**The economics of pipe line diameters** (*Engin. and Contract.*, 49 (1913), No. 2, pp. 237-240, figs. 8).—In a paper taken from the proceedings of the Pacific Northwest Society of Engineers C. W. Harris analyzes, mathematically and graphically, methods for determining economical pipe line construction for power development, water supply, and irrigation, considering first the smallest pipe which will deliver a given amount of power; second, the smallest allowable diameter without exceeding allowable velocities; and third, economical diameter considering the value of the water right.

The following points are summarized as solutions to these considerations:

When the water consumed has no value it is allowable to use the smallest possible pipe line for power which, with a friction loss of one-third of the total head, will deliver a quantity of water sufficient to produce the required power with the other two-thirds of the total head.

If a pipe line is subjected to a varying head throughout its length, but the cost for any particular diameter remains constant for those various heads, the diameter should also remain constant throughout; but if the cost of the pipe is different for the different heads the diameter should be smaller for the larger head. The correct diameter under any particular head is that which will make  $n/5$  of the cost of the pipe for a given length equal to the capitalized value of the power consumed by friction in that same length,  $n$  being 2 for steel pipe and 1.5 for wooden stave pipe, and for any pipe taking the index of  $d$  in the expression,  $\text{Cost} = kd^n$ , in which  $k$  is a constant depending on the cost of steel per pound, interest, depreciation, etc. With this diameter determined under one head the diameter of the same pipe under any other head should vary inversely as the seventh root of the head if the pipe is a high-pressure steel pipe, or as the ninth root of the head if the pipe is wood stave. If the quantity to be delivered is fixed, and the available friction loss is also fixed, as is the case with a pipe line connecting two reservoirs of fixed elevations, the diameter of the pipe line should vary throughout the length thereof according to the laws expressed above, the head to which the pipe is subjected being the static head for which the pipe is designed.

**Light-iron irrigation flume** (*Engin. Rec.*, 68 (1913), No. 6, p. 153, figs. 3).—This article notes the use of light semicircular ingot-iron smooth flumes installed on a light wooden substructure on the Pala Indian Reservation in California. The sections vary from 12.5 to 15 in. in radius. After completion carrying capacity tests gave a value for the coefficient of roughness in Kutter's formula of 0.010 for a 30 in. diameter flume. The total cost, including substructure, was \$2.61 per lineal foot.

**Heavy oil as fuel for internal combustion engines**, I. C. ALLEN (*U. S. Dept. Int., Bur. Mines Tech. Paper 37*, pp. 36; *Sci. Amer. Sup.*, 76 (1913), No. 1977, pp. 326, 327; *Indus. Engin. and Engin. Digest*, 13 (1913), No. 9, pp. 392-395).—A review of heavy fuel oils available for use in internal combustion engines is followed by a discussion of heavy oil engines, including the Diesel and semi-Diesel types and a summary of the requirements of heavy oil engines.

relating to ease of starting, steady and efficient operation at all loads, complete combustion, simplicity in regulation, and low first cost.

The fuel economy of heavy oil engines is briefly summarized as follows: Approximately 0.4 lb. of oil is consumed per horsepower hour, whereas for a steam engine of the best triple expansion type from 1.1 to 1.8 lbs. of fuel are necessary, thus giving an economy ratio of approximately 1:3 in favor of the oil engine.

Fuels that may be successfully used in heavy oil engines are enumerated as follows: Petroleum products, "Steinkölle" oil products, bituminous oils, lignite products, turf oils, shale oils, vegetable oils, animal oils, alcohols, and wood oils.

Specifications for fuels and lubricants for heavy oil engines are summarized as follows: The oil should be neddle at 0° C. Sluggish oils should be heated before being introduced into the engine, and oil should contain not more than 0.4 per cent of material insoluble in xylene. The residue on cooking should not be greater than 3 per cent and there should not be more than a trace of free carbon in the oil. At least 80 per cent of the oil should distill over at 350° and heavy oils and residues should properly be distilled before using. The flash point should be between 60 and 100°. A heavy oil containing no material having a low flash point should be enlivened by the addition of about 2 per cent of a "gas oil," the flash point being 60 to 100° or less. The specific gravity should not be greater than 0.920. The heating value should be not less than 1000 calories, the hydrogen content not less than 10 per cent, and the sulphur content not more than 0.75 per cent. The oil should contain no free ammonia, alkali, or mineral acids, not more than 0.05 per cent of noncombustible mineral matter, and not more than 1 per cent of water. The resin content should be low, the paraffin content not more than 15 per cent, the erucic acid content not more than 12 per cent, and the asphaltum content sufficiently low to allow the fluid to flow. Fine atomization is essential.

The viscosity of lubricants should be between 9 and 10° Engler at 50°. The lubricants should be liquid at -25° and should not freeze solid above -40°. The flash point should be between 230 to 240° in a Pensky-Martens closed tester. The lubricant should lose not more than 10 per cent by carbonization when agitated with concentrated sulphuric acid, should dissolve completely and clearly in benzene, and should be free from acids and alkali. Animal and vegetable oils should not be used.

It is stated in conclusion that the heavy oil engine can not yet be considered as fully developed, but the fact that petroleum containing as high as 20 per cent asphaltum as well as oils from tars have been successfully used is most encouraging for its future.

**Naphthalin for gas engines** (*Gas Engine*, 15 (1914), No. 8, pp. 455, 456). Attention is called to the use of naphthalin in internal-combustion engines. It is stated that this material consists of approximately 91 per cent carbon and 9 per cent hydrogen, melts at 174° F., boils at 424°, and has a specific gravity of 1.15.

Carbureters adapted to the use of naphthalin are (1) those which melt and vaporize the naphthalin itself, and (2) those which vaporize a solution of the substance in some volatile liquid. Ether is the best solvent, but its cost is prohibitive. Benzene dissolves from 30 to 40 per cent at atmospheric temperature, and alcohol may be also used, although in every case a heated carbureter is necessary.

The advantages claimed for naphthalin are as follows: It is not readily inflammable; for a given amount of work it occupies smaller space than gasoline;

It solidifies in cold air, thus minimizing the possibility of leakage; and it has a definite composition.

In French tests of this fuel a 4-cylinder motor with a 135-mm. bore and a 145-mm. stroke developed 35 h. p. at 888 r. p. m. at a cost per brake horsepower hour of about  $\frac{1}{4}$  ct., and a 2-cylinder motor with an 88-mm. bore and 140-mm. stroke developed 8 h. p. at 1,100 r. p. m. at a cost per brake horsepower hour of about  $\frac{1}{4}$  ct.

The naphthalin motor, O. H. HAENSSGEN (*Gas Engine*, 15 (1913), No. 10, pp. 537-542, figs. 6).—The mechanical details and operation of several makes of both 2- and 4-cycle motors operating on naphthalin fuel are described. All of these require a light liquid fuel for starting and stopping and for generating heat, either in the exhaust or in the cooling water, sufficient to melt the naphthalin.

Connecting electric motors for direct drive, C. B. MILLS (*Brick and Clay Rec.*, 43 (1913), No. 5, pp. 468-470, figs. 2).—This article takes up the purely mechanical considerations in the application of electric motors to machinery and deals with the advantages and disadvantages of several styles of connections between motor and machine, including belt, rope, toothed chain, gear-and-pinion connections, and cushion and flange couplings for direct connections.

The transmitting powers of belts and ropes at various speeds are graphically represented and designs of connections are mathematically analyzed. It is stated that since the armature of the average type and size of motor is composed of a great number of parts of little mechanical strength it is important to choose a method of connection which will tend to absorb or minimize shock and vibration.

Installation and care of storage batteries, H. M. NICHOLS (*Sci. Amer. Sup.*, 76 (1913), No. 1965, pp. 130, 131).—This article considers the layout and installation of storage batteries and takes up in detail their operation and maintenance, including the location and correction of the most frequent troubles. These are enumerated as short-circuiting, sulphating, flaking, disintegration, and warping of the plates. It is stated that each cell in a battery should be carefully inspected and tested, when fully charged, once a week, and that a record should be kept of weekly inspections of each cell for comparative purposes.

The Winnipeg tractor trials, L. W. ELLIS (*Sci. Amer.*, 119 (1913), No. 16, pp. 201, 204).—These trials, the sixth of their kind, brought out the fact that both large and small farmers are now more keenly interested in the medium to small general-purpose tractor.

The tests consisted of (1) a 2-hour economy brake test; (2) a 4-hour maximum brake test; (3) a 3 to 5-hour economy, efficiency, and capacity plowing test; and (4) a careful comparison of design and construction. Out of 500 points the first was allotted 150, the second 50, the third 200, and the fourth 100. The highest net score attained was 437.3 points. The brake showings were quite uniformly good, and little distinction was made between the tractors on design and construction. A new feature was the use of a vibration detector. The most severe criticisms on design and construction were on lubricating systems and insufficient protection of working parts from mud and dust.

The plowing tests were held on ground which had been plowed before and which had a 2 ft. growth of weeds. The average cost of plowing per acre for steam engines was 46.3 cts., for kerosene 50.9 cts., and for gasoline 62.1 cts. The 5- and 6-plow tractors plowed about  $1\frac{1}{2}$  acres per hour, the 4-plow rig about 1 acre, 8-plow rigs behind large gas tractors  $2\frac{1}{2}$  acres, and 10-plow rigs  $2\frac{1}{2}$  to 3 acres. Plow for plow the steam engines showed more capacity, largely due to higher geared speed of travel.

Revolution counters on both engines and brakes showed a variation in belt slipage of from 0.3 to 1.5 per cent.

Gasoline tractors averaged close to 4 times as many horsepower hours per unit of fuel as steam tractors, while kerosene tractors secured about 3 times the fuel efficiency of the steam tractors. Excluding labor costs, however, the steam tractors developed brake horsepower at a rough average of 20 per cent less than the kerosene engines and every steamer defeated every gasoline tractor on fuel cost per unit of brake power. This is considered a powerful factor in retaining the moderate-sized steam tractor of from 50 to 75 h. p. wherever threshing is of greater importance than plowing.

Tables of data are appended showing the most important points of comparison, the total scores, and the relative standings.

**Mechanical cultivation in Germany.** F. BORNEMANN and B. DORNÄH (*Die Motorkultur in Deutschland*. Berlin, 1913, pp. VIII+326, figs. 126).—This book, based on the results of extended experiments, deals, in connection with mechanical cultivation, with economy in the purchase of motor cultivating machinery in Germany, and calls attention to the special points to be considered in the judgment and choice of the various types for various classes of work. A chapter on historical development is followed by a discussion of the relation of mechanical cultivation to political and actual working economy.

From a comparison of motor plows and scarifiers with steam tractor plows it is concluded that the first two are best adapted to shallow surface cultivation while the last is adapted to deep plowing. A comparison of mechanical and electrical cultivation indicates that the first is on the whole the cheaper. An exhaustive discussion of the mechanical details of motor cultivating machinery calls particular attention to those points to be criticized in selecting or buying machinery for various works.

Descriptions of several single systems include both disk and moldboard plows, among which are (1) a plow and motor built together in a single frame, (2) one in which they are in separate frames and connected by chains or other coupling, (3) rope and whiplass-drawn gang plows, (4) rotating disk plows, and (5) motor scarifiers.

In conclusion it is stated that so far no motor cultivators have been put upon the market which are adapted to all conditions, and that their profitable use is a matter depending on the good judgment of the owner.

**Various devices for drying the autumn forage harvest.** RATH (*Hilus, Landw. Ztg.*, 32 (1912), No. 89, pp. 741, 742, figs. 174). Several devices are illustrated and described which are used in Germany, Sweden, and the hill lands of other European countries. Among these are wooden rail frames, post and wire frames, and posts fitted with teeth.

## RURAL ECONOMICS.

**Coöperation and nationality.** G. W. RUSSELL (*Dublin*, 1912, pp. 163).—The various rural activities as they bear upon the social and economic life of a nation and its rural population are discussed in this volume in chapters with the following headings: The problem of rural life, past and present conditions, need for an agricultural revolution, the rise of agricultural coöperation, building up a new social order, town and country, organized communities and political life, the creation of citizens, women on the land, union of men and women workers, farmers and the State, ideals of the new rural society, and life finding its level.

**The legal status of farmers' cooperative associations** (*Internat. Inst. Agr.* [Rome], *Mo. Bul. Econ. and Soc. Intcl.*, 4 (1913), No. 10, pp. 18-25).—This

article enumerates and describes briefly some of the difficulties experienced in organizing farmers' cooperative associations under existing laws in the United States and calls attention to special provisions made for such associations in the States of California, Wisconsin, Massachusetts, Nebraska, and Texas.

**Agrarian reforms and the evolution of the rural classes in Russia.** P. CHARLES (*Rev. Econ. Internat.*, 10 (1913), IV, No. 1, pp. 55-85).—This article discusses and illustrates the significance of various agricultural questions in Russia, as, for example, the work of the rural bank and its relation to emigration in Russian Asia, the growth of rural estates, transition from agricultural collectivism to individual property, the redistribution of land and the breaking up of the village community, the results of agricultural organization, and the progress of rural agriculture during the last few years.

**United effort for farm betterment and rural progress** (*Farm and Home* [Mass.], 34 (1913), No. 731, pp. 632, 633, figs. 4).—This article outlines the plan and describes the efforts of the Hampden County Improvement League of Massachusetts to consolidate the various agencies in the county for economic social progress in the small villages and rural districts. In the 6 months since the league was formally organized, pledges of financial support aggregating over \$10,000 have been obtained and a corps of 3 advisers appointed. More than 300 farmers have been visited and advised as to methods, fertilizers, land drainage, seeds and seedling, testing milk, judging and selecting dairy animals, etc., and 412 farmers about general orcharding. The advisers have also aided in purchasing lime and fertilizers, introducing alfalfa and other crops, and forming local organizations. In one of these, the fruit growers' association in Granville, the members have received from \$3.75 to \$4 per barrel for apples this year while nonmembers received from \$2.75 to \$3. Other illustrations of the work are given.

**Agricultural credit banks of the world** (*Banking Law Jour. Yearbook*, 1913, pp. 40, figs. 12).—A brief but comprehensive discussion of the actual operations of foreign mortgage loan systems and the cooperative agricultural credit system is here presented. Accounts of typical mortgage loan banks are given which serve to illustrate the relation of agriculture to the credit facilities in the various countries.

**Cooperative credit associations in Canada.** T. K. DOHERTY (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 6, pp. 16-22).—This article presents a brief summary of the conditions leading to the establishment of cooperative credit banks or associations in Canada, describes their system of administration, and submits a statement as to the amount of business done by a number of them.

There were 98 such associations in the Province of Quebec in 1912, besides several in Ontario. The capital is raised by selling shares and by utilizing the profits. A member's liability does not exceed the limited amount of stock he can hold, and he has but one vote. Loans for purposes which conform with the aims of the association are granted on the note of the borrowing shareholder alone or may be guaranteed by other solvent members. The running expenses of these associations are found to be light, the only official being the business manager, who is paid according to the time he devotes to the work. Further details are presented by notes and tables.

**The work of the special agricultural credit institutes in 1912** (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Econ. and Soc. Intel., 4 (1913), No. 10, pp. 55-63).—The work of the special agricultural credit institutes in 11 Provinces of southern Italy and Sicily which under the law of 1911 came under the management of the savings department of the Bank of Naples and the agricultural credit department of the Bank of Sicily, respectively, is briefly summarized.

Tables are given showing amount of loans granted by each institution for various farm operations, together with the security therefor. The operations conducted by the Bank of Naples during the year amounted to 9,553,833 francs, the loans on legal preference mortgages representing 63.42 per cent, those not so secured 30.04 per cent, and those secured on the deposit of agricultural produce 6.49 per cent. Of the total loans 11,736, amounting to 1,327,375 francs, were granted to landholders working their farms, and 6,142, amounting to 2,753,899 francs, to tenant farmers. The agricultural credit department of the Bank of Sicily granted loans during the year to 38,155 intermediary organizations, amounting to 12,025,435 francs.

Tables are given showing the classification and amount of loans according to the different crops and the position of the borrower.

**Government valuation of land** (*New Zeal. Off. Yearbook 1912*, pp. 692-624).—The various features of the Valuation of Land Act, passed by the New Zealand Government in 1896 and amended in 1908, are described here in detail. The valuation rolls, showing the selling value of all land in the Dominion, are used for taxation purposes as a basis on which loans may be granted by the New Zealand State-guaranteed Advances Office and for the guidance of the Land Purchase Board when acquiring land under the Land for Settlements Act, and by others who may desire to ascertain the selling value of any piece of land for investment, mortgage, etc.

Tables are given showing the capital value of the land with improvements, together with improved values by counties and boroughs, 1878-1912.

**Studies of primary cotton market conditions in Oklahoma**, W. A. SHAWMAN, F. TAYLOR, and C. J. BRAND (*U. S. Dept. Agr. Bul. 36*, pp. 36). This bulletin presents the results of a market survey made in 106 towns in Oklahoma in which were secured samples of over 3,200 bales of cotton with records of date and place of sale and price paid to the grower. Comparisons are made as to the classification of the grades and the difference in prices paid in some markets on the same day for bales of identical quality. Such variation in prices is shown to have amounted to as much as \$12.50 per bale for low middling cotton. "The greatest losses to the farmers under the present system of marketing appear to lie in their failure to secure the premium for their high grades which these grades finally bring."

Notes and tables are given showing in detail the results of the survey.

**An example of successful farm management in southern New York**, M. C. RUSSELL and J. H. BARBOUR (*U. S. Dept. Agr. Bul. 32*, pp. 24, figs. 51). This bulletin describes at length the methods employed by a farmer without previous experience in converting a farm and paying expenses into a profitable enterprise. It gives the method of solving some of the important problems in farm management by improving the dairy, diversifying crops, the use of rotations, and the intelligent use of horse and man labor. Tables are given showing the cost, yield, and income of the various farm operations.

**What I know about farming**, E. J. GRINNELL (*Minneapolis, Minn., 1913*, pp. 324, pls. 37).—In this book the author discusses, largely from his own experience, various phases of farming and farm life, such as soil fertility and fertilization; the business farmer and his qualifications; farm buildings; pastures and meadows; the vegetable garden; corn and small grains; small fruit raising; the orchard; trees and farm forestry; the flower garden; bees; poultry; stock breeding; dairying; frosts and sprays; the woman on the farm; early-day farming in the East; and miscellaneous other subjects.

## AGRICULTURAL EDUCATION.

**Agricultural and forestry instruction in Italy, A. KASTNER** (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 108-128).—An account is given of the present status of agricultural and forestry instruction in Italy administered by (1) agricultural high schools at Milan, Perugia, and Portici; (2) royal technical agricultural schools, including the viticultural schools at Alba, Avellino, Vigarani, Catania, and Conegliano; (3) royal agricultural special schools, viz. the Royal Pomological and Horticultural School at Florence, and the Royal Veterinary and Dairy School at Reggio-Emilia; (4) royal practical agricultural schools of which there are 28; (5) 3 private agricultural institutions including the Agricultural Colonial Institute at Florence, and 2 practical schools; (6) agricultural and housekeeping schools for girls; (7) agricultural experimental institutions; (8) itinerant agricultural instruction; (9) travelling agricultural libraries; and (10) the Royal School of Forestry at Vallombrosa, and the Royal School for the Training of Forest Guards at Cittaducale.

[**Agricultural and forestry instruction in Austria and Italy**] (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. V+168+LXIX).—In addition to several articles abstracted elsewhere in this issue, this report includes (1) statistics of agricultural education institutions in Austria in 1912-13, showing an addition during the year of 1 agricultural intermediate school, 5 agricultural winter schools, 2 housekeeping schools, an agricultural winter and vegetable culture school, and a school for fruit growing, and the discontinuance of a farm and hop culture school, 2 agricultural winter schools, a housekeeping school, and a brewing school; (2) a review of agricultural literature, and (3) a list of the agricultural and forestry education institutions in Austria with their faculties.

The celebration of the anniversary of the Imperial Royal High School of Agriculture of Vienna (*Land u. Forstw. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 1-11). This is an account of the celebration on May 8 and 9, 1913, of the one-hundredth anniversary of the establishment of the institute for forestry instruction, known later as the forest academy at MariaBrunn, which in 1815 was transferred to the High School of Agriculture of Vienna as the first institute for higher instruction in forestry; also of the fortieth anniversary of the establishment of the High School of Agriculture of Vienna, concerning which a description of its most important periods of development is given.

**Report of the department of agriculture of Norway, 1912** (*Nærskov, Offentl. Foræst. Landbr. Fremr.*, 1912, III, *Statsforæst.*, pp. LXXXV+35+594).—This report gives a comprehensive survey of the work of the various government agencies established for the advancement of Norwegian agriculture and its various branches. The annual reports of the state agricultural experiment stations, seed control stations, milk control stations, and cow-testing associations are included.

**World's dairy schools**, trans. by J. H. MONRAD (*N. Y. Produce Rev.* and *Amer. Cream.*, 36 (1913), Nos. 6, pp. 258, 259; 7, pp. 392, 394; 8, p. 348; 10, p. 430; 11, p. 472).—This condensation of a lecture delivered by Dairy Counselor G. Ellibrecht at the Dalum Dairy School in Denmark gives an account of the facilities for dairy instruction in Norway, Sweden, Finland, Prussia, Holland, Belgium, and Switzerland.

**Practical School of Aviculture** (*Rev. Vet. e Zootech.*, 3 (1913), No. 4, pp. 257-261).—The objects and methods of instruction of the Practical School of Aviculture of Ascurra in the Federal District of Rio de Janeiro are set forth. The school has an extensive area of land with equipment for an essentially practical instruction. Its object is to train students to direct poultry farms or enterprises, and to become poultry specialists. The students assist in the work

of the farm and each in turn has charge of the various operations in poultry keeping. A 3 months' course is offered, beginning each quarter.

**Vocational education.** R. O. SMALL (*Amer. School Bd. Jour.*, 37 (1913), No. 4, pp. 12, 13, 55, 56).—According to this article vocational agricultural departments were in operation in 1912 at 5 Massachusetts high schools. Two county high schools and 4 new departments in high schools have since been established. The scheme of agricultural work devised provides productive home-farm operations carried on for profit by the pupils at the same time they are studying the agricultural science bearing upon these operations. During the year 11 different types of farm projects were selected, ranging from a small garden to a dairy in which 12 Jersey cows were handled and money transactions to the extent of \$1,200 engaged in. See also a previous note (E. S. R. 28, p. 106).

**The importance, extent, and execution of student practice at agricultural schools** (*Land u. Forst. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 18-33).—This symposium of practitioners in agricultural schools discusses their use in agricultural intermediate schools (*Mittelschulen*) by Fritz Schneider; in farm schools by Aldo Gross, and in agricultural winter schools by H. Marosch.

**Efforts to reform the system of gardening instruction.** K. SCHUMER (*Land u. Forst. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 37-41). The new management of the Imperial Royal Horticultural Society of Vienna is endeavoring to bring about a reform in the system of gardening instruction in Austria, and as a first step is establishing horticultural apprentice schools, 4 of which are now in operation with good attendance. The principal object of these schools is to extend the technical knowledge and general culture, and to give some commercial training. The instruction is given for 2 years during the 6 winter months, 9 hours a week in 3 periods from 6 to 8 p. m., and on Sundays from 9 to 12 a. m.

There is also a 2-year course in the schools for gardeners' assistants, admission to which requires the completion of the full course of the apprentice schools. Both schools offer practical summer courses in the first year. The first Austrian horticultural week was held from December 9 to 11, 1912, in Vienna, to give experienced gardeners opportunity to learn of the results of recent investigations and experience. Suggestions are also given for the instruction of persons desiring to learn gardening who can not attend school. For the training of horticulturists higher horticultural schools are provided.

**Proposals to bring about uniformity in the methods of instruction in the lower agricultural schools with special reference to schools for wine growers.** F. JACHIMOWICZ (*Land u. Forst. Unterrichts Ztg.*, 27 (1913), No. 1-2, pp. 42-54).—The author suggests and discusses as the most feasible and practical school for the majority of farmers a 3-semester school with a small farm and offering temporary spring and summer courses. The 2 winter semesters should each include 30 hours a week of theoretical instruction, and the summer semester should be devoted almost exclusively to practical work.

**Farmers' institutes in Kansas.** E. C. JONES (*Ag. Ed. [Kans. Agr. Col.]*, 5 (1913), No. 22, pp. 39).—This pamphlet describes briefly the purpose, character, organization, and methods of work of the farmers' institutes in Kansas, and is intended primarily as a handbook for the institute officers.

Suggestive topics for institute meetings are given on soil fertility, soil tillage, the summer fallow, crops, seed and seed selection, crop rotation, weeds, plant diseases, insects, silos and silage, dairying, beef production, farm animals, the orchard and the garden, roads, marketing, cooperation, organizations, tenant farming and labor, farm management, the home, and sociology.

**A catechism of agriculture.** T. C. ATKINSON (*New York and London, 1913, pp. XII+96, figs. 34*).—This work is a revision of that previously noted (E. S.



R., 21, p. 91), considerably enlarged to make a fairly comprehensive treatment of the general field of elementary agriculture. Sections on farm crop management, dairy management, and farm management, have been added, and the work is illustrated for the first time.

**A course in agriculture for the high schools of Michigan.** W. H. FARREN (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 11, 1913, pp. 73*).—This course is outlined in detail, together with suggestions and syllabi on the several subjects to be taught. Lists of agricultural reference books, Michigan Station bulletins, sample score cards, and an outline of work in nature study and elementary agriculture, with suggested exercises and experiments that should be undertaken with pupils in the sixth and seventh grades by the high school teacher of agriculture in cooperation with the grade teachers are appended.

**The principles of agriculture through the school and the home garden.** C. A. STEINER (*New York, 1913, pp. XXVIII+380, figs. 139*).—This text has been planned for use in the upper four grades. The features of the book are the "problem questions" and "home studies," information as to profitable marketing, instructions concerning the forming of agricultural clubs, and data on the plan and purposes of the Boys' and Girls' Junior Garden Club.

The method of the book is far removed from merely dogmatic instruction, the pupils being challenged to test and reason. The apparatus required is limited and inexpensive. The language is direct and very evidently has the children in mind.

**Practicums for pupils in the chemical laboratory of agricultural intermediate schools.** A. KWIŚKA (*Land u. Forstw., Unterrichts Ztg., 27 (1913), No. 12, pp. 12-171*).—The author discusses the object and character of chemical laboratory practicums for pupils in intermediate agricultural schools and outlines such work for a 3-year course.

**An old and well-known child's plaything as an expedient in forestry instruction.** (*Contrib. Gesam. Forstw., 39 (1913), No. 7, pp. 327-332*).—Detailed directions are given for making a miniature model forest for use in forestry instruction.

**The story of our trees.** MARGARET M. GIBSON (*Cambridge: University Press, 1912, pp. VII+160, figs. 74*).—This book is arranged in 24 lessons, each complete with its own practical work. The lessons are fitted into the natural cycle of seasons, and are also adapted to the school year. A list of reference books and information concerning diagrams and lantern slides, material, and revision questions are appended.

**Common trees: How to know them by their leaves.** V. M. HULLYER (*Baltimore, Md.: Calvert School (1913), pp. 39, figs. 37*).—This manual is arranged with a descriptive text of each tree family and its members, together with their leaf silhouettes.

**The planting of home grounds.** V. H. DAVIS (*Agr. Col. Ext. Bul. (Ohio State Univ.), 8 (1913), No. 9, pp. 16, figs. 25*).—The author discusses the extent of grounds, lawns, style, fences, trees, shrubs, and flowers, and points out a number of common errors in treatment. A list of trees, shrubs, etc., that are desirable for Ohio and other States of similar climate is included.

**Wisconsin Arbor and Bird Day annual, 1913** (*Madison, Wis.: State Supt. Pub. Instr., 1913, pp. 109, pls. 5, figs. 27*).—The governor's proclamation of May 2, 1913, as Arbor Day is followed by material on forestry, bird life, wild animal life, fire prevention, and good roads, with suggestions on how considerable of this material may be used throughout the year in connection with the regular school branches.

**Illinois Arbor and Bird days.** F. G. BLAIR (*Ill. Dept. Pub. Instr. Circ. 68, 1913, pp. 71, figs. 54*).—A collection of nature lessons on trees and birds, to

gether with nature poems, some of which were written by eighth and second-grade pupils.

**Arbor Day program, April 25, 1913** (*Boise, Idaho: Dept. Ed., 1913, pp. 17*).—This pamphlet contains the governor's Arbor Day proclamation, suggestions for carrying out the day's program, and hints on tree planting.

**Farm arithmetic**, C. W. BERRY and K. D. SWANZEL (*New York and London, 1913, pp. XIII+280, pt. 1, figs. 122*).—This farm arithmetic is designed for use in the last 2 or 3 years of the elementary school. The problems presented deal with plant and animal feeding, dairy products, the soil, field crops, fruits and vegetables, farm mechanics, silos, forestry, farm accounts, etc. Answers are given to all the problems.

**List of references on rural life and culture** (*Washington: U. S. Bur. Ed., 1913, pp. 51*).—An annotated bibliography with a list of the periodicals indexed in its preparation.

### MISCELLANEOUS.

**Twenty-fifth Annual Report of Colorado Station, 1912** (*Colorado Sta. Rpt., 1912, pp. 51*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a report of the director on the work and publications of the station, and departmental and other reports.

**Twenty-fifth Annual Report of Massachusetts Station, 1912** (*Massachusetts Sta. Rpt., 1912, pts. 1, pp. 249, pls. 11; 2, pp. 97, pls. 71*). Part 1 of this report contains the organization list, a list of publications during 1912, a financial statement for the fiscal year ended June 30, 1912, a report of the acting director, departmental reports, and numerous special papers. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Part 2, which is the portion designed for general distribution, consists of papers of a popular nature, abstracted elsewhere in this issue and based on the results of observations and experiments of the station, and of a brief summary by the acting director of the more important conclusions from these articles.

**Monthly bulletin of the Western Washington Substation, September, 1913** (*Washington Sta., West. Wash. Sta., Mo. Bul., 1 (1913), No. 1, pp. 16, figs. 7*).—This series has been begun to give information relative to agricultural practice under western Washington conditions. The initial number includes brief articles on the following subjects: Farm Management—Green Forage—Fall Seeding, by H. L. Blanchard; Selection of Potato Seed, and A Good Crop for the Orchard, by J. L. Stahl; Trap Nests and Their Use, by V. R. McItride; Developing Early Maturing Corn, by B. Stookey; Fair Exhibits of Horticultural and Agricultural Products, by J. L. Stahl and B. Stookey; and Identification of Plant Diseases by Station, Directions for Making Bordeaux Mixture—Black Leg of Potato, and Harvesting and Storing Potatoes with Reference to Disease, by H. L. Rees.

**Organization of the Department of Agriculture, 1913** (*U. S. Dept. Agr., Organ. Dept. Agr., 1913, pp. 31*).—This publication describes briefly the work of the various branches of the Department and enumerates the officials responsible therefor.

**Organization and conduct of a market service in the Department of Agriculture discussed at a conference held at the Department on April 29, 1913** (*U. S. Dept. Agr., Organ. and Conduct Market Serv. in Dept. Agr., Apr. 29, 1913, pp. 15*).—A summary is given of the proceedings at this conference, including an address by C. H. Powell on The California Citrus Industry, Its Organization and Operation (pp. 2-6), and abstracts of other addresses.

**List of free and available publications of the United States Department of Agriculture of interest to farm women** (*U. S. Dept. Agr., List Free Pub., of Interest to Farm Women, 1913, pp. 11*).—About 200 publications, classified by subjects, are listed.

## NOTES.

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**Kansas College and Station.**—Work has been begun on the new hog chowera plant to consist of a two-story brick building 60 by 40 feet for laboratories, and an office, a crematory for refuse, and a set of cement hog pens. The cost of the plant will be about \$10,000.

Charles H. Taylor has been appointed in charge of animal husbandry work in the extension division. John W. Calvin, assistant in animal nutrition, has been appointed assistant professor of agricultural chemistry and assistant chemist in the Nebraska University and Station beginning February 1. V. V. Detwiler has been appointed assistant in industrial journalism.

**South Dakota College.**—Press reports announce that President R. L. Slarie has been appointed president of the University of South Dakota beginning February 1. Dr. O. E. White, formerly instructor in botany and subsequently an assistant and graduate student at the Bussey Institution, has accepted an appointment as plant breeder in the Brooklyn Botanic Garden.

**American Association for the Advancement of Science.**—At the sixty-fifth meeting of this association, held at Atlanta December 29, 1913 to January 3, 1914, former Dean Bailey of Cornell University was chosen vice-president of Section M, the new section on agriculture. The Society of American Foresters was accepted as an affiliated society. The next meeting of the association will be held in Philadelphia.

**Massachusetts Federation for Rural Progress.**—This organization was formed at a meeting held at the Massachusetts Agricultural College October 21, 1913, under the auspices of the college, the State Board of Education, the State Grange, and the Western Massachusetts Chamber of Commerce. About 15 organizations participated in the meeting. The constitution, as adopted, provides for a council, an executive committee, and three commissions dealing respectively with farm improvement, marketing and exchange, and community life. President Bitterfield of the college was chosen president, Dr. David Suedden, state commissioner of education, vice-president, and E. L. Morgan, community field agent of the college, secretary-treasurer.

**Third Congress of Tropical Agriculture.**—This congress will be held in London, June 23-30, under the presidency of Prof. Wyndham Dunstan, director of the Imperial Institute. Among the topics to be considered are technical research in tropical agriculture, scientific problems in rubber production, methods of developing cotton cultivation in new countries, problems of fiber production, agriculture in arid countries, and hygiene and preventive medicine in their relation to tropical agriculture. Papers on these subjects may be submitted to, and further information obtained from, the organizing secretaries of the congress Dr. T. A. Henry and H. Brown, Imperial Institute, London, S. W.

**Fifth International Congress of Rice Culture.**—This congress is to be held at Valencia, Spain, during the second week in May. It will be divided into sections dealing with the breeding, manuring, culture, and harvesting of rice, rice diseases, commerce in rice, and cooperative methods in rice production and market

ing. Papers may be submitted in any language, but unless in French, Italian, or Spanish should be accompanied by a summary in Spanish. Additional information may be obtained from the Royal Commissioner of Public Works at Valencia, who will serve as president of the congress.

**Agricultural Appropriations in New York State.**—Among the special appropriations granted by the New York legislature in 1913 were the following: (1) For the establishment of a state school of agriculture and domestic science at Ithaca, \$50,000, (2) for the purchase of lands and erection and equipment of buildings for the New York State School of Agriculture on Long Island, \$100,000, (3) for the maintenance and improvement of buildings of the Schenck State School of Agriculture at Coldeskill, \$22,800, and (4) for the establishment of a course in practical agriculture at the Plattsburgh State Normal School, \$2,500.

The *Rural New Yorker* announces that 3 parcels of land at Farmingdale, Long Island, have been purchased as the site of the new state school of agriculture for Suffolk County at a cost of \$87,000.

**State Aid for Agricultural Instruction in Tennessee.**—An act of the Tennessee General Assembly of 1913 increases the state school fund from 25 to 33 1/3 per cent of the gross revenues, or by several hundred thousand dollars annually. One of the purposes of this increase is to encourage the introduction of agriculture, home economics, manual training, and kindred subjects into county elementary schools under adequate supervision, through supplementing the salaries of supervisors in these subjects. For the present school year \$10,000 will be available for this purpose, and each supervisor may receive therefrom an amount equal to one-half of the salary provided by the county, but not less than \$200 and not more than \$500.

The act also provides that a portion of the state high school fund may be devoted to the encouragement of these subjects in county high schools. The State Board of Education is authorized to apportion to the high school fund of any county in which the proceeds from the high school tax do not amount to \$2,000 in any one year, the amount necessary to make a high school fund of \$2,000, but not, however, to exceed \$1,500 to any one school in any one year, or a total of \$50,000 for all schools. Counties receiving such aid must comply with the regulations of the State Board of Education with reference to purchases, equipment, licensing of teachers, and courses of study.

**High School Visitors in Texas.**—The board of regents of the University of Texas has recently made provisions for the employment of high school visitors who will give special attention to the development of manual training, domestic economy, and agriculture. The university now accredits all these subjects for admission to the freshman class.

**Agricultural and Home Economics Instruction in the Public Schools of Porto Rico.**—A recent number of *Porto Rico Progress* announces that a special teacher in agriculture has been provided for every district in the island except San Juan, and teachers of household economies in 18 towns. To provide time for instruction in agriculture, manual training, home economics and other special subjects, the course of study has been rearranged. Boys in the sixth, seventh, and eighth grades will have 3 periods a week for manual training and 2 for agriculture, while the girls in the same grades will have cooking 3 times a week and sewing the other 2 days. To keep the instruction uniform the Department of Education will send out a monthly bulletin outlining the work in these subjects to be taken daily.

**University of Manchester.**—The new laboratory for research work in agricultural entomology was opened November 13, 1913, by Sir Sidney Olivier, permanent secretary of the Board of Agriculture and Fisheries. A laboratory

room 58 by 28 feet is available, together with a smaller laboratory, an experimental field with greenhouses, etc. Dr. A. D. Innes, formerly forest entomologist of the government of India, has been appointed first reader in agriculture, entomology and will conduct researches and supervise the work of research students.

**First Horticultural School for Women in France.**—The first horticultural school for women in France, a higher school of horticulture for young women, was opened in the latter part of 1913 at Brie-Comte-Robert, near Paris, under the auspices of the Union for the Agricultural and Horticultural Instruction of Women.

**Farm Women's Clubs in France.**—The minister of agriculture of France has issued a circular addressed to the directors of the departmental agricultural services authorizing them to organize farm women's clubs in as many communities as possible, for the promotion and dissemination of instruction in home economics and agriculture. These clubs are to supplement the instruction given in the 3 months' courses of the home economics schools now operating in France and in the post-scholastic home economics schools, to aid former students of these schools to perfect their studies and to give women in general an opportunity to procure a professional domestic knowledge.

The clubs of each department are to be federated and these departmental federations combined into a national federation of farm women's clubs, to be administered by a central committee at the seat of the ministry of agriculture.

**Pomological Experiment Station in South Russia.**—A new experiment station for pomology known as the Salghir Station has recently been established in the Crimea in South Russia in the town of Simpheropol. The director of the station is S. Mokshetsky, entomologist. The station is anxious to enter into relations with the pomological and horticultural institutions of the United States.

**Proposed Agricultural College in Ceylon.**—Plans are being made for the establishment of a Tropical Agricultural College on the grounds of the Ginzurowa Experimental Station, where a tract of 400 acres is available. It is estimated that the main college building and equipment and quarters for the staff and students will cost from 200,000 to 400,000 rupees (\$97,300 to \$129,770.) It is expected that the staff of the Ceylon Department of Agriculture will be available for a portion of the instruction work, but that a botanist will also be needed.

**Miscellaneous.**—The American Phytopathological Society has elected officers for 1914 as follows: President, Dr. Haven Metcalf of Washington, D. C.; vice-president, Dr. F. D. Kern of State College, Pa.; and counsellor, H. R. Fulton of West Raleigh, N. C.

An association of economic entomologists has been formed in Germany and held its first meeting at Magdeburg the latter part of October, 1913. Dr. L. O. Howard was elected an honorary member.

The National Geographic Society has awarded a medal in honor of the late Prof. F. H. King, of the University of Wisconsin, for his well-known work on Chinese agriculture.

Dr. Shosuke Sato, professor and dean of the college of agriculture of Tohoku University, has been designated as the exchange professor of Japan to American universities for 1914.

The Second Annual Conference of Editors of Agricultural Colleges and Experiment Stations will be held at the State University of Kentucky June 25 and 26.

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